RAQ/DESQ

Installation & User's Guide

AXIA

A TELOS ALLIANCE COMPANY

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p/n 1490-00086-001

USA Class A Computing Device Information To User. Warning:

This equipment generates, uses, and can radiate radio-frequency energy. If it is not installed and used as directed by this manual, it may cause interference to radio communication. This equipment complies with the limits for a Class A computing device, as specified by FCC Rules, Part 15, Subpart J, which are designed to provide reasonable protection against such interference when this type of equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference. If it does, the user will be required to eliminate the interference at the user's expense.

NOTE: Objectionable interference to TV or radio reception can occur if other devices are connected to this device without the use of shielded interconnect cables. FCC rules require the use of only shielded cables.

Canada Warning:

"This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the Radio Interference Regulations of the Canadian Department of Communications." "Le present appareil numerRadiusue n'emet pas de bruits radioelectrique depassant les limites applicables aux appareils numerRadiusues (de les Class A) prescrites dans le Reglement sur le brouillage radioelectrique par le ministere des Communications du Canada."

CE Conformance Information:

This device complies with the requirements of the EEC Council Directives: 93/68/EEC (CE Marking); 73/23/EEC (Safety – low voltage directive); 89/336/EEC (electromagnetic compatibility). Conformity is declared to those standards: EN50081-1, EN50082-1.

Important Safety Information

ELECTRICAL WARNING

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. The installation and servicing instructions in this manual are for use by qualified personnel only. To avoid Electric Shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to trained service personnel.

When using this equipment, the following safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to people.

- Read and understand all instructions.
- Follow all warnings and instructions marked on the equipment.
- Installation must be performed in accordance with all national wiring rules.

Caution: DOUBLE POLE/NEUTRAL FUSING

The Axia QOR power supply incorporates an internal fuse. Hazardous voltages may still be present on some of the primary parts even when the fuse has blown. If fuse replacement is required, replace fuse only with same type and value for continued protection against fire.

This product's power cord is the primary disconnect device. To prevent risk of electric shock, disconnect power cord before servicing. The outlet to which this equipment is connected must be installed near the equipment, and must always be readily accessible. The unit should not be positioned such that access to the power cord is impaired. If the unit is incorporated into a rack, an easily accessible safety disconnect device should be included in the rack design.

This equipment has an autoranging line voltage input. Ensure that the supply voltage is within the specified range.

This equipment is designed to be operated from a power source that includes a third “grounding” connection in addition to the power leads. Do not defeat this safety feature. In addition to creating a potentially hazardous situation, defeating this safety ground will prevent the internal line noise filter from functioning.

MOISTURE WARNING:

This equipment is intended for INDOOR USE ONLY and can be hazardous if immersed in water. To reduce the risk of electrical shock, do not expose this product to rain or moisture. Keep moisture away from the ventilation openings in the top and front of the unit. To avoid the possibility of electrical shock, do not use this equipment when you are wet. If you accidentally drop the equipment into water, do not retrieve it until you have first unplugged all cords. Do not reconnect this equipment until it has dried thoroughly. Do not shower or bathe with the unit.

VENTILATION WARNING

This equipment requires the free flow of air for adequate cooling. Do not block the ventilation openings in the top and sides of the unit. Failure to allow proper ventilation could damage the unit or create a fire hazard. Do not place the units on a carpet, bedding, or other materials that could interfere with any panel ventilation openings.

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Customer Service

We support you...

By Phone/Fax.

- You may reach our 24/7 Support Team anytime around the clock by calling +1 216-622-0247. For billing questions or other non-emergency technical questions, call +1 216-241-7225 between 9:30 AM to 6:00 PM USA Eastern Time, Monday through Friday.

By E-Mail.

- Non-emergency technical support is available at **Support@AxiaAudio.com**.

Via World Wide Web.

- The Axia Web site has a variety of information which may be useful for product selection and support. The URL is **http://www.AxiaAudio.com**.

Feedback

We welcome feedback on any aspect of the Livewire products or this manual. In the past, many good ideas from users have made their way into software revisions or new products. Please contact us with your comments.

Updates

The operations of RAQ, DESQ, and QORs are determined largely by software. Periodic updates may become available - to determine if this is the case, visit our web site periodically, or contact us for advice concerning whether a newer release is more suitable to your needs.

We recommend joining the Axia Tech mailing list to ensure that you receive immediate updates regarding new software or documentation releases. You can do so by clicking the "Sign Up Here" links at the top of the Axia Download and Manuals pages at AxiaAudio.com/manuals/ and AxiaAudio.com/downloads/.

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Warranty

This product is covered by a five year limited warranty, the full text of which is included in the rear section of this manual.

Service

You must contact Axia before returning any equipment for factory service. Axia will issue a Return Authorization number, which must be written on the exterior of your shipping container. Please do not include cables or accessories unless specifically requested by the Technical Support Engineer at Axia. Be sure to adequately insure your shipment for its replacement value. Packages without proper authorization may be refused. US customers please contact Axia technical support at +1 (216) 241-7225. All other customers should contact their local representative to arrange for service.

We strongly recommend being near the unit when you call, so our Support Engineers can verify information about your configuration and the conditions under which the problem occurs. If the unit must return to Axia, we will need your serial number, located on the rear panel.

Credit Where Credit's Due

It's a pleasure to be a part of this organization. Thanks to all of the engineers, architects and designers that made this console a reality - you know who you are. *cn*

Feedback is welcome

At Axia, we love to hear your feedback. If you find anything in this manual that you feel needs clarification or correction, please let us know by sending an e-mail to cnovak@AxiaAudio.com .

About This Manual

This manual covers the details of the RAQ and DESQ control surfaces and the QOR series engines. RAQ and DESQ are designed to operate as standalone consoles; however, it also has network capabilities. To learn more about these concepts, you may wish to read ***Introduction to Livewire: System Design Reference and Primer*** and ***Audio Over IP: Building Pro AoIP Systems with Livewire*** by Steve Church and Skip Pizzi, available from Elsevier Press.

In these publications we explain the ideas that motivated Livewire and how you can use and benefit from it, as well as nitty-gritty details about wiring, connectors, and the like. Since Livewire is built on standard networks, we also help you to understand general network engineering so that you have the full background for Livewire's fundamentals. After reading this reference material, you will know what's up when you are speaking with the network guys that are often hanging around radio stations these days.

Although we strive for accuracy, some features and operational characteristics may differ in actual use from their descriptions herein. We invite feedback and corrections from our clients.

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A Note From The President of Axia

In 2003, Telos launched the Axia Audio division based on an idea. That idea sparked a whole new approach to radio consoles, using Ethernet as a high-speed expressway – the routing infrastructure for audio and data inside the radio station.

Howard Aiken, the scientist responsible for the conceptual design of IBM's groundbreaking Harvard Mark I computer, once advised "Don't worry about people stealing your ideas. If your ideas are any good, you'll have to ram them down people's throats." Sure enough, during our first few years, the idea of using Ethernet to transport audio was so novel that we spent most of our time simply telling people our story, sleeping in hotel beds – and bringing home very few sales.

After what seemed like an endless stream of hotel desks and airline food the idea took hold, thanks to forward-thinking engineers who understood the power of using data networks for audio transmission. Our first installations proved that the technology was real. Then those engineers began sharing stories of their own, telling other folks how much they loved what Axia did for them. Word got around, and we sold thousands of consoles (enough that Element consoles are now one of the best-selling broadcast boards ever).

As more and more broadcasters embraced IP, dozens of companies partnered with us to make innovative broadcast products that connect to Axia networks with just the click of an Ethernet cable. And we conceived of some interesting new devices and applications to help broadcasters take full advantage of their networked environment.

For example, we introduced broadcast VoIP telephone systems that integrate with consoles, merging telephony into the studio network without adding infrastructure (and giving broadcasters the world's first consoles with integrated Telos hybrids). Intercom systems that connect via Ethernet, and permit users to take broadcast-quality intercom calls to air instantly. Networked codecs and audio processors like the Telos Zephyr iPort and Omnia.8X, which concentrate multiple audio devices into a single network node, significantly changing the economics of complex systems.

And along the way, we expanded our talented staff of engineers, scientists and broadcast professionals, growing the largest R&D organization in the industry. We're also the first and only broadcast equipment maker with a 24/7 support team that's ready to offer assistance any time of the day or night. As they say, radio never sleeps – so neither do we.

We realize that it's not due to our efforts alone that these things have happened — it's due to yours. We owe quite a lot to you, and we will never, ever forget it. You are, literally, the reason we are here! And we will continue to innovate, explore, think and invent, for one simple reason: we love to hear you say "Wow!"

Michael "Catfish" Dosch

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Crimping the spade lugs,

the smell of soldering flux —

they'll be missed. (Not much.)

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Getting Started

The following chapters of this manual will give you an in-depth understanding of the capabilities of your new RAQ or DESQ surfaces, from installation to advanced functions. This section will help you get everything connected quickly, and point you to the parts of the manual you'll need to get up and running with a minimum of fuss.

RAQ consists of these components:

- **RAQ mixing surface:** 6-fader rackmounted frame with master controls and meters.
- **QOR.16 or QOR.32:** Rack-mounted CPU chassis with audio I/O and GPIO connectors.

DESQ consists of these components:

- **DESQ mixing surface:** 6-fader frame with master controls and meters.
- **QOR.16 or QOR.32:** Rack-mounted CPU chassis with audio I/O and GPIO connectors.

Making Connections

You've probably unpacked your boxes and are sitting next to a pile of Axia gear, wondering what to do first. Here's what you need to know in order to get started:

1. Packed with your RAQ/DESQ is a cable with 6-pin Molex™ connectors on each end. This is the power/communications cable. Connect the end of the cable without the strain relief to the port on the underside of your RAQ or DESQ control surface. Connect the other end of the cable to the connector labeled CONSOLE on the back of your QOR unit.
2. Connect audio sources (microphones, CD players, etc) to inputs of your QOR.
3. Connect monitor amplifiers, headphone amplifiers, etc to outputs of your QOR. Be sure to set all amplifiers to their minimum volume setting.
4. Follow the instructions found in Chapter 1 to configure IP address settings for your RAQ/DESQ.
5. Refer to the User's Manuals packed with any other Axia Audio nodes for information on how to configure IP addresses for these units.

What's Next?

When you've completed physically connecting your Axia hardware, jump to Chapter 2 for a quick tutorial on configuring audio sources. With that done, you'll be a hop, skip, jump away from being on-air! After that, you'll likely want to do some in-depth reading about all that your new console can do. Here's a brief description of the contents of the following chapters:

- **Chapter 1: Setup and Connections** explains connections and basic setup.
- **Chapter 2: Inputs and Outputs** explains how to generate Source Profiles and construct backfeeds for selected sources.
- **Chapter 3: Surface Operations** takes you behind the scenes to explore operator controls and options.
- **Chapter 4:Show Profiles** illustrates how to set and save unique "snapshots" tailored for specific shows. These Show Profiles can be instantly recalled whenever needed.
- **Chapter 5: GPIO** tells how to associate routable logic commands with any audio source.
- **Chapter 6: Advanced Controls** discusses advanced features that are configured in configuration web pages.
- **Chapter 7: Livewire Networking** and QOR will tell you how to connect your console to a network and reap the benefits of networked studio systems.
- **Appendices** provide additional technical specifications and a complete set of block diagrams for your reference.

Stay up to date! We recommend joining the Axia Tech mailing list to ensure that you receive immediate updates regarding new software or documentation releases. You can do this by clicking the "Sign Up Here" link at the top of AxiaAudio.com/manuals/ & AxiaAudio.com/downloads/.

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Open box, connect —

Seven pounds of pure power.

Who needs big consoles?

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Fast Five:

How to Pass Audio in 5 Minutes or Less

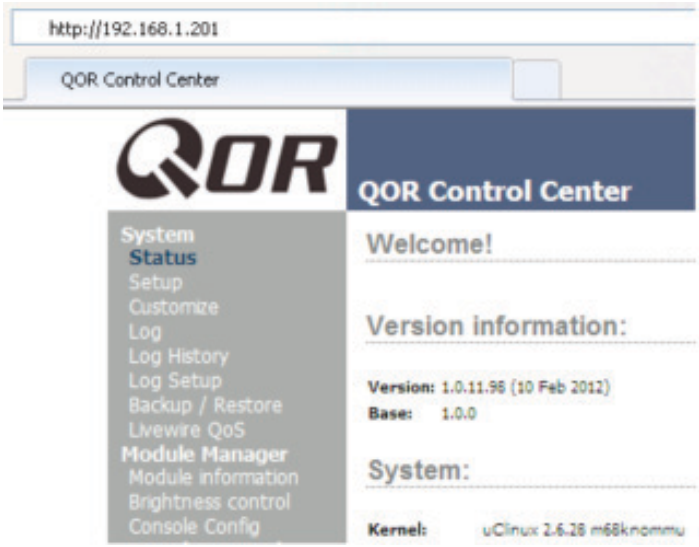
1. Connect the DESQ/RAQ to the Console port at the rear of the QOR.
2. Connect an analog stereo source to IN 1 (preferably a professional line level source)
3. Connect a microphone to XLR 1
4. Connect powered speakers or speaker amplifier to OUT 1
5. Connect headphone amplifier to OUT 2
6. Connect power to the QOR

Quick configuration: Set a computer with a static network address. The default IP address of the QOR will be 192.168.2.27. So configure a static IP address of 192.168.2.100, subnet mask 255.255.255.0, with no Gateway setting nor DNS settings.

If you wish to use a different subnet for your Livewire network, assign the appropriate IP address to the QOR and a static IP address to the computer you are using within the same subnet. To set the QOR IP address, press and hold the METER button on the RAQ/DESQ to access the system window on the large OLED display. Use PREVIEW knob to highlight (rotate) or select (press). Highlight and select the NETWORK option. Highlight and select the IP ADDRESS option. From this window you can edit the IP address of the QOR (Select each 8-bit position and edit as needed). If you edit any network settings, select the SAVE + REBOOT option to implement the changes.

Connect the personal computer's NIC (Network Interface Card) to a 100 BT port at the back of the QOR (the computer should have a static IP address).

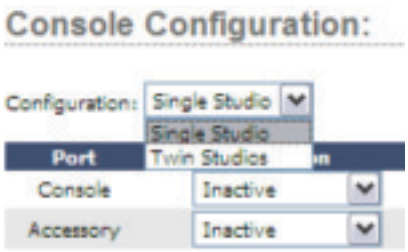
Open a browser of choice with the computer and type the QOR's IP address into the URL field of the browser.



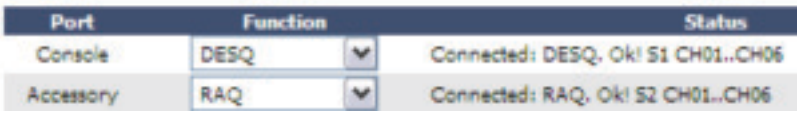
Select the Console Config link from the list on the left. Authentication response is:

Username: user
Password: (blank, there is no password)

Select single studio if you have a single DESQ or RAQ. Select twin studio if you have two connected to the same QOR.



Define the surface connected to the port.



Select the **Inputs** link from the list on the left.

- Adjust the Microphone-1 gain stage as needed for the microphone connected. Press Apply button.
- Enter the name Stereo Source next to Analog 1.
- Press Apply button.

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Select the Outputs link from the list on the left.

- Enter the name “Monitor Spkrs” next to Analog 1. In the neighboring drop down, select CR Monitor.
- Enter the name “Headphones” next to Analog 2. In the neighboring drop down, select CR Headphones.
- Press the Apply button.

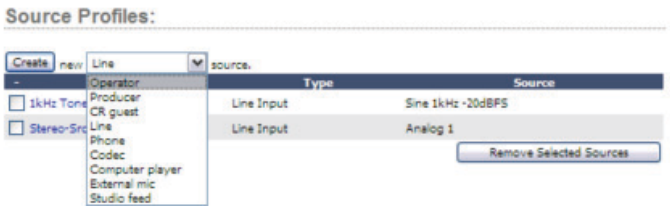
Select the Sources link from the list on the left.

- Press the Create button.
- Enter 1kHz Tone in the Source name field.
- Select the “Sine 1kHz -20dBFS” option in the Source input drop down.
- Press the Ok button.

Press the Create button again.

- Enter “Stereo-Src” in the Source name field.
- Select “Analog 1” option in the Source input drop down.
- Press OK button.

Select the “Operator” option in the drop down and then press the Create button.



- Source name field enter as “My Mic.”
- Source input set as Microphone 1.
- Press Ok.

On the console, press in the top (“Options”) knob of channel 1 (the first fader position).

- Rotate the knob to highlight “My Mic”, press the knob.
- Locate the Soft Key of channel 1 and press it twice.

Do the same for channel 2 but select “Stereo-Src”. Again for channel 3, selecting “1kHz Tone”.

Above the MONITORS knob, press the PGM 1 button so that you are monitoring Program 1.

For channel 1, 2, and 3, press the PGM 1 button to assign the channel to those mixes.

Press the ON button for channel 3 and adjust the linear or rotary fader for the channel until you see the PROGRAM 1 meter on the OLED display reach -20. Adjust the MONITORS knob as needed for proper monitoring volume in the speakers.

Press the ON button again for channel 3 to turn off the channel.

Press the ON button for channel 2 and adjust the levels of the source. Make sure there is audio coming from your stereo source.

You should now be listening to your favorite Steely Dan song.

Press the ON button for channel 1. If all the above steps were followed, the speakers should now be muted.

Place the headphones on your head and adjust the knob for HEADPHONES for a comfortable volume.

Turn off channel 2 and adjust the level of channel 1 as you speak into the microphone. If you are not able to get adequate levels from the microphone, you may need to adjust the gain stages as instructed in the earlier step at the Inputs link.

Congratulations! Now turn channel 1 off, turn channel 2 on, and sit back to your favorite tunes as you read the remainder of the manual.

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Chapter One:

Setup and Connections

Introduction

If you are reading this manual, you are probably the proud owner of a new RAQ or DESQ console. Thank you!

The Basics

This chapter covers connecting the QOR to your other studio gear, such as microphones, CD players and other audio playback devices. The audio outputs of the QOR connect to control room monitors, preview (cue) speaker, headphones amplifiers and audio recording devices. These external audio devices may be analog or AES devices.

The GPIO (General Purpose Input Output) ports provide logic control interfaces to devices such as air lights, recorders and CD players.

The 100 Mbps Ethernet ports may be used to connect PCs running Axia's IP-Audio driver, to expand your system by adding other Livewire devices such as Axia Audio Nodes, or equipment from Axia Partners (see AxiaAudio.com/partners/ for the latest list of companies whose equipment connects directly to Axia networks).

1000 Mbps (Gigabit) Ethernet ports are used to connect to other QOR units or an Ethernet core switch - another topic covered in Chapter 7.

A 6-pin Molex connector is used to connect your RAQ or DESQ surface with the QOR mixing engine.

Assigning an IP Address

Before you can configure your hardware, you'll need to assign it an IP address. Press-and-hold the Meter Options key for five seconds. The meter display now shows the options and the Preview control is used to navigate, select IP Address options and change parameter values. Consult your network administrator if you are unsure about what address to use.

Each QOR requires a single, fixed IP address. The RAQ or DESQ control surfaces are controllers for the QOR, so they share the same IP addresses. See Chapter 7 for more details when multiple QORs are used or when a QOR is a part of a larger network.

Notes on Physical Installation

The QOR is fan-free, so it can be located in any studio without fear of unwanted noise. Those vents and heat sinks serve a very important purpose! Be sure to mount the QOR in an equipment rack with free air flow. We recommend using a ventilated 1RU rack spacer above and below the QOR to ensure adequate ventilation.

To install the DESQ surface in your studio, all you need is a desk – no cutout required. To install the RAQ surface, all you need is 4 RU in a standard 19 inch rack.

QOR: Front Panel

The indicator panel of the QOR, shown on the following page, is very simple. There are no controls for you to push or turn. Configuration and setup is performed from the console itself or through the web browser interface.

Front Panel Indicators

Even though there are no knobs or dials, the front panel has some very useful indicators that tell you about the health and status of your QOR. In all cases, solid GREEN indicates normal operating conditions.

CHECK

This is a general health indicator for the QOR. If this indicator is RED, immediately check the web pages for abnormal operating conditions such as excessive CPU temperature. Do not ignore this indicator. Note that it is normal for this indicator to flash during boot-up.

LIVEWIRE

When lit, indicates that Livewire channels are being taken from the network. If no network sources are being received, this indicator is not illuminated.

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Figure 1-1: QOR - Front Panel

SYNC

If the QOR is part of a larger network, a solid GREEN indicates the QOR is synchronized as a slave to the Livewire network and that its internal clock is locked. Flashing GREEN indicates that sync packets are being received, but that QOR is not yet locked. It is normal for the **SYNC** indicator to flash for several seconds at startup. If it does not "lock" with a solid, non-flashing LED, this may indicate an incorrectly configured network switch. Check your Ethernet switch configuration or call Axia 24/7 Support for assistance.

MASTER

Solid GREEN indicates the QOR is synchronized as a Master clock to the Livewire network. This indicator will always be green for a standalone console. If you have any other Livewire devices, they should be reporting Sync or Slave. There should be only one Master clock device in a Livewire network at any given time.

Note: The MASTER and SYNC indicators are not normally ON at the same time since the QOR will be either a Master or Slave. This principle applies to all Axia Livewire devices. Any Livewire network will have only a single Master.

NET 1 and NET 2

When the Gig1 or Gig2 ports have active connections, the NET1 or NET2 lamps (respectively) will illuminate. If a network cable is connected to a Gig port and the corresponding NET lamp is unlit, a problem with the network connection is indicated.

When a disconnected Ethernet link has been re-established, the NET LED will blink with a 50% duty cycle for about 5 seconds as the network activity is resumed.

Please consult Axia's Ethernet switch configuration guides for details when using Core switches in a larger network. Ethernet Switch guides may be found on our web site at AxiaAudio.com/manuals/.

PSU

The PSU indicator provides assurance that the QOR power supply rails are normal. Solid GREEN indicates normal power supply status.

IP

This indicator will illuminate upon detection of an external Ethernet core switch connected to the QOR.

QOR: Rear Panel

Power

- AC Mains: There is one standard IEC receptacle for your mains power for voltages in the range from 100 to 240 VAC at either 50 or 60 Hz.

Audio Connections

The QOR's rear panel contains all of the connectors used for audio I/O, Ethernet, GPIO, power supply and the connections to your control surfaces. Note that we use RJ-45 connectors for three purposes:

- Analog audio inputs and outputs
- AES audio inputs and outputs
- Ethernet (some with PoE - Power over Ethernet)

It is important to follow the proper conventions for wiring these connectors and ensure that the connector functions are not confused as damage may result if you plug a network cable into an audio input.

Analog and AES Audio

The connector pin functions shown in Figure 1-3 are the same for both the AES and Analog inputs and outputs.

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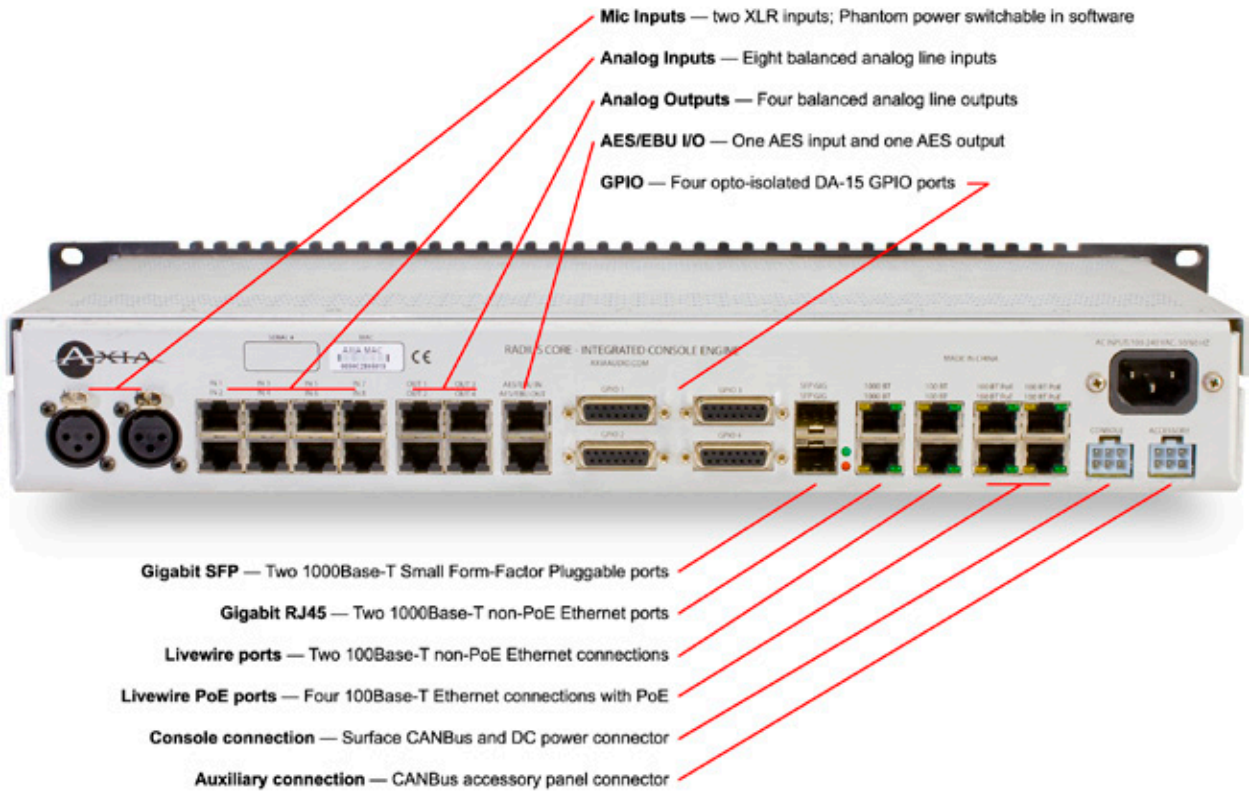

Mic Inputs — two XLR inputs; Phantom power switchable in software
Analog Inputs — Eight balanced analog line inputs
Analog Outputs — Four balanced analog line outputs
AES/EBU I/O — One AES input and one AES output
GPIO — Four opto-isolated DA-15 GPIO ports
Gigabit SFP — Two 1000Base-T Small Form-Factor Pluggable ports
Gigabit RJ45 — Two 1000Base-T non-PoE Ethernet ports
Livewire ports — Two 100Base-T non-PoE Ethernet connections
Livewire PoE ports — Four 100Base-T Ethernet connections with PoE
Console connection — Surface CANBus and DC power connector
Auxiliary connection — CANBus accessory panel connector

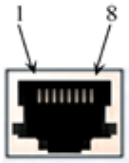
Figure 1-2: QOR.16 - Rear Panel Connections

The nominal audio level for analog line inputs and outputs is +4 dBm. This audio level will provide you with 20 dB of headroom.

Note: The well-labelled RJ-45 connectors on the QOR rear panel are used for different functions. Be sure to use them only for their intended purpose as described in this section.

Microphone Inputs

There are XLR-F connectors on the rear panel for connection of microphone inputs. These connectors use the standard wiring convention for 3-pin XLR audio connectors. These connectors may have 48-volt Phantom power enabled via the QOR's web page configuration. Please take appropriate precautions if you connect anything other than a microphone to these inputs when Phantom power is enabled.



LINE and AES INPUT CONNECTORS	
Pin	Function: Analog/AES
1	Left Channel Input + /AES +
2	Left Channel Input - /AES -
3	Right Channel Input +
4	Not Connected
5	Not Connected
6	Right Channel Input -
7	Not Connected
8	Not Connected

Figure 1-3: RJ-45 Audio Connector Pinouts

GPIO Connections

The QOR includes GPIO ports, with pinouts in the same configuration as the GPIO ports on other Axia products. Please refer to **Chapter 5: Configuring GPIO** for the functions of these ports and wiring diagrams for their DA-15 connectors.

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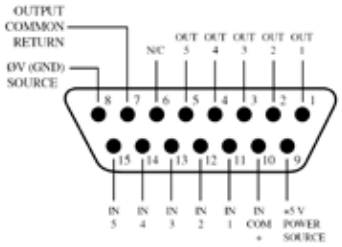

Figure 1-4: GPIO Connector Pin-Outs

In most cases, a GPIO port will be associated with a single source such as a CD player, studio microphone, profanity delay, *et cetera*.

Optional PathfinderPC software may also be used to monitor and control GPIO for advanced applications.

The interconnections to GPIO ports will vary depending on the type external equipment being used and whether or not voltage is supplied by an external device. **Chapter 5: Configuring GPIO** provides these details.

Ethernet Connections

The QOR has three types of Ethernet connections and it is important to use them as intended since the internal Ethernet switch is configured in a specific manner. The types of connectors available are:

- 100 Mbps PoE (Power-over-Ethernet) ports designed to be used with future Livewire accessories that will obtain their power directly from their Ethernet connections. These ports may also be safely used with standard, non-PoE devices.
- 100 Mbps Ethernet standard ports are used to connect PCs or other Livewire devices to your Livewire network. These devices might include additional Livewire nodes or PCs running the Axia IP-Audio driver.
- Two 1000 Mbps (Gigabit) ports are used for connections to other QOR units, or, in larger networks, for connections to an Ethernet Core switch. Note that these two ports are used as trunks and are not intended for connection to Livewire source devices such as Audio Nodes.

RAQ/DESQ CANBus Connections

RAQ/DESQ frames need only a single data / power connection to operate. The QOR includes the needed power/CANBus connections for use in conjunction with your control surfaces. The accessory CANBus port is an additional port that is available for future use.

Important: Like any electronic device, RAQ/DESQ can be affected by static electricity. Use of a personal grounding device is strongly recommended while handling the unit during installation.

Your RAQ/DESQ surfaces **must** be connected to a grounded metal permanent wiring system or other equipment grounding conductor using the grounding lug located on the console chassis. For ground sources, we recommend, in order of preference:

- "Station Ground," the heavy copper strap found in the walls and floors of many radio studios.
- AC Safety Ground — the "3rd prong" of a nearby outlet.
- A bonded electrical conduit.

#12 AWG GREEN stranded wire is the *minimum* wire gauge acceptable for grounding the mixer.

Important: Grounding reduces the risk of electric shock by providing a "path of least resistance" for electric current. Improper grounding can result in a risk of electric shock.

Check with a qualified electrician if you are in doubt about how to properly ground this equipment. If your local electrical code prohibits the use of a Station Ground for this purpose, as described above, use the specific "Safety Ground" your local regulations mandate.

Console

There is one 6-pin Molex connector that is used to provide DC power (48 vdc) plus CANBus data to your control surfaces.

The RAQ and DESQ surfaces must be connected to a CanBus port on the QOR using only the supplied 6-conductor cables. One end of the CANBus cable is fitted with a strain relief. Connect this end to the Molex connector on the back of the QOR. Connect the other, smaller connector to the Molex socket on the control surface.

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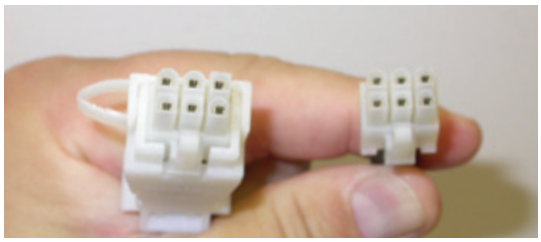

Figure 1-5: Detail of data/communication cable ends.

Since the CANBus connection cables include power as well as data, there is a length restriction of approximately 50 feet. If you require longer cables than those supplied with your QOR, please contact your Axia representative.

IP Address Configuration

To access System Settings from a RAQ or DESQ surface, press-and-hold the Meter Options key for five seconds. The Meter display now shows the options and the Preview control is used to navigate, select options and change parameter values. Options available are:

- IP Address
- Subnet Mask
- Gateway
- Save and Reboot

To exit, select EXIT.

Note: After making changes to any QOR IP address settings, you must reboot the unit for these changes to take effect.

"Gateway" settings on an QOR are not usually required; however, a valid gateway enables access to the QOR configuration remotely, from outside your network. A gateway also facilitates the use of an external NTP server. Enter the IP address of your master router (the one with external network connections) whenever you're given the option to enter a gateway address.

Note: If your system employs an Ethernet core switch, the Ethernet core switch must have an IP address that is lower than any of your QOR units or Ethernet edge switches. This function of the IGMP standard ensures that the multicast querier is handled by the core switch if one exists. The querier will be passed off transparently to another switch should the core switch fail or be disconnected.

What's Next?

Take a break! You're done with initial set-up. When you're ready, continue to **Chapter 2: QOR Inputs and Outputs** to walk through the software configuration of the Inputs and Outputs on your QOR.

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In our youth we

never dreamed that, one day, streams

might not have water

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Chapter Two:

Inputs and Outputs

In this chapter we'll discuss how to configure the inputs and outputs for your RAQ and DESQ consoles by using your computer's web browser. While browsing this chapter you may find useful the block diagrams in Appendix B.

QORs have built-in Ethernet switch and Web server-for options configuration. To access it, all you need is a computer connected to its Ethernet switch. Since Livewire IP addresses are managed without DHCP, you will need to ensure that your PC has a manually-assigned IP address in the same subnet as the QOR. Contact your network administrator if you are not sure how to set up a fixed IP address for your PC (but if you're reading this, we think you've probably got it covered yourself).

> ***Note:*** Axia web interfaces have been tested with Microsoft(TM) Internet Explorer, version 6 or later, but also work with other browsers.
>
> Adobe(TM) Flash Player is used for some real-time monitoring features but is not essential for setup and configuration. If installed, your pop-up blocker must be disabled. You may download Adobe Flash Player at http://get.adobe.com/flashplayer/.

Once your PC is properly connected to the Axia Livewire network, direct your web browser to the IP address of your QOR. When you connect to it, you will be prompted for a user name and password. By default, the user name is "**user**" and there is no password.

First, we'll walk through the **Audio IO Manager** to configure your **Inputs** and **Outputs**. Then, we will illustrate how **Source Profiles** and **Show Profiles** are used with your QOR system.

Inputs

Your QOR has several connectors on the rear panel that accommodate microphones, analog stereo line and AES inputs. Chapter 1 discussed the details of these physical connectors. Now, let's look at the software configuration of these inputs.

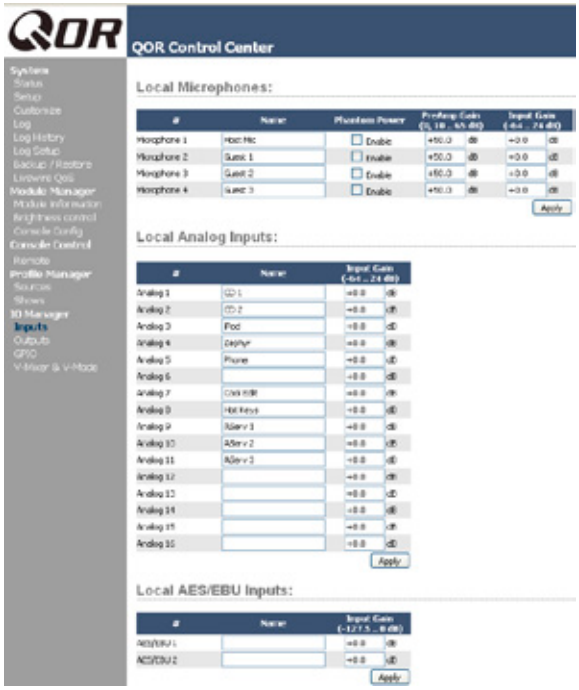

Figure 2-1: Audio IO Manager - Inputs from QOR.32

Figure 2-1 shows the web page configuration for Inputs for your QOR. There are three types of inputs.

Microphone Inputs

XLR-type connectors on the rear panel are intended to be used for mono microphone signals. Each of those inputs has the following parameters:

- **Phantom Power** (48 vdc) is individually enabled for each of the four microphone inputs by selecting this check box.
- **PreAmp Gain** is adjustable to a maximum of 65 dB. This setting will adjust the microphone level prior to all other signal processing.
- **Input Gain** is adjustable from -64 to +24 dB. If you are conservative with your PreAmp gain, you may wish to apply a few dB of additional gain at this stage.

Analog Line Inputs

The eight inputs in the QOR.16 or 16 inputs of a QOR.32 are for line-level stereo signals connected to

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the analog line RJ-45 connectors on the rear panel. They have only one adjustment.

- **Input gain** allows you to specify a gain from -64 to +24 dB.

AES/EBU Inputs

AES/EBU digital inputs are on RJ-45 connectors. The digital input is equipped with a sample rate converter so a specific incoming sample rate or AES clock is not required.

- **Input gain** allows you to specify a gain from -127.5 to 0 dB.

Be sure to click **Apply** after making changes in each input section.

Now that the inputs have been tweaked for proper system audio levels, we can manage that audio and automatically associate logic with the different sources you have connected to your QOR. We use a concept that we call **Profiles** to do this.

What's a Profile?

A Profile is a group of console parameters that are stored in memory for instant recall. The use of Profiles makes the operation of your RAQ or DESQ quick and intuitive. In the RAQ/DESQ console's design, there are two types of profiles: **Source Profiles** and **Show Profiles**. Show Profiles (discussed in detail in Chapter 3) contain all of the "snapshot" settings that would be associated with a scene or preset. This terminology is commonly used in the sound reinforcement or recording studio industries.

Show Profiles

Our **Show Profiles** keep track of monitor bus settings, fader channel assignments, jock preferences, feature lockouts and many other parameters.

You will use your web browser directed at the IP address of the QOR to set up RAQ and DESQ options including both types of profiles.

Source Profiles

One of the most repetitive and tedious parts of studio building has always been tying "data" to audio sources. Consider the wiring of analog line selector modules: you needed a cable for the remote audio source, a set of wires for a "start" closure, another set for "stop" — even with TDM routers, an operation as seemingly simple as logic-follows-audio often turns out to be not so simple.

Mix-minus and IFB generation has also been a problem in the past. Too often it's a complicated process that requires air talent to correctly determine source and bus assignments at a moment's notice. How many times has unwanted audio been aired thanks to this error-prone procedure?

The RAQ/DESQ eliminates these headaches by automatically merging audio, logic and program data into a single, routable information stream.. Since audio in a Livewire network is transported as packetized data, it's easy for us to "piggyback" other data along with the audio. This association is accomplished through the use of Source Profiles.

A Source Profile contains all of the parameters that are unique to a specific audio input (source) as it applies to a specific RAQ or DESQ console. Source Profiles can assign modifiers to an audio input. Characteristics like Pan, Trim and even Mix-Minus source selections can be set in the Source Profile and automatically loaded whenever that source is assigned to a RAQ or DESQ fader.

The result of all this is that RAQ or DESQ is always presented with complete, consistent information about how you want a given audio input (source) to be handled. Your board operator will never have to worry about Mix-Minus again!

Source Configuration

The QOR web browser interface is used to configure Sources. To get started:

- Open the web browser on your computer and point it to the IP address you previously assigned to your QOR.
- You'll be prompted to enter a user name and password.

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The default user name is "**user**". Leave the password field blank.

- Select **Sources** to proceed to the source setup page.

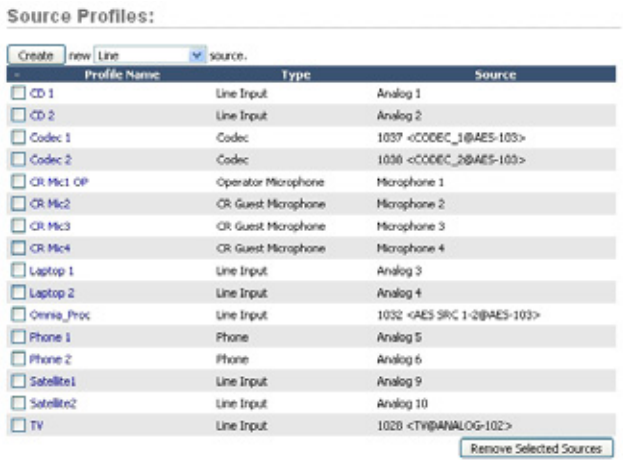

Figure 2-2: Source Profiles

You will now see the Sources section as shown in Figure 2-2. In this example, many of the sources have already been configured.

Note that there are three different classes of audio sources. Most originate with the rear panel input connectors and are used locally with a RAQ or DESQ; some audio sources may be obtained from other devices in your Livewire network, and some audio sources (PGM1, PGM2, etc) are generated internally.

With that in mind, let's discuss configuring your local sources and making them available for fader assignment.

Creating a New Source

Your first choice defines what type of source you're setting up, which is important since GPIO, mix-minus and other console behaviors are decided based on your choice. Your choices:

- **Operator** is the board operator's mic. It is the source mic for TALK TO functions. Its logic mutes the CR monitors and Preview when ON.
- **Producer** is used for in-studio Producer's mic positions. It has associated GPIO logic which can operate TALK TO functions from a remote producer's panel. It also mutes CR monitors and Preview when ON.
- **CR Guest** is used for any other guest mic in the control room. Its associated logic automatically mutes the CR monitors and Preview when ON.
- **External Mic** is used for any mic located outside of a CR or studio. It functions like a Guest microphone but does not include any muting logic.
- **Line** is used for any line input audio source, analog or digital. A GPIO logic port can be used to provide machine start/stop pulses if desired.
- **Phone** defines this source as a hybrid or broadcast phone system input. A summed mono mix-minus is automatically provided.
- **Codec** marks this source as a codec. A dual mono mix-minus is provided; one PA feed (right) + one talent feed with talkback (left).
- **Computer Player** defines this source as originating from a PC. Associated GPIO logic can be used to send start/stop signals to a playout system.
- **Studio Feed** defines a source that receives a backfeed, and generates an IFB backfeed in return. This is intended for an external studio source which you wish to generate a talkback channel for.

Once you have selected the source type, click the **Create** button to proceed to the Source Profile options.

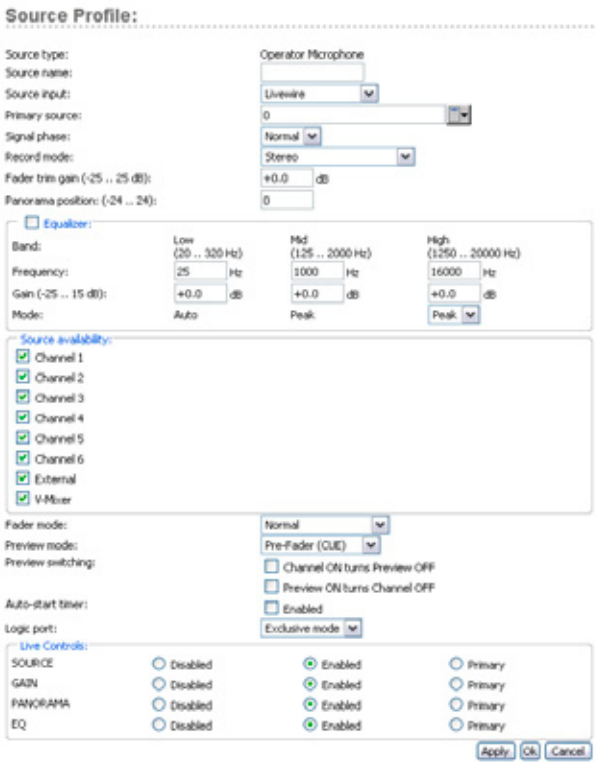

Figure 2-3: Operator Microphone Source

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Figure 2-3 shows the setup options screen for a typical Microphone source. Figure 2-4 shows a Codec source which has a few different settings, and Figure 2-5 shows a Line source. The following sections describe these Source configurations in detail.

Source Type

This display-only parameter shows you the source type as selected in the previous step (Line, Codec, etc).

Figure 2-4: Codec Source

Source Name

Each Source needs a name for display on the console's OLED channel displays. Names can be up to 10 characters long and may include spaces or underscore characters.

Source Input

This setting associates the source with an audio input. It may be a **local** input in which case you would choose a local Mic, Analog or AES from the drop-down menu. This source may also be a **Livewire** source which means that it is a network source originating from some other Livewire device. When you choose Livewire as your Source Input, you will specify a network source. See **Chapter 7: Livewire Networking** for details.

Primary Source

This pop-up window is used to select the network Livewire source ONLY when **Livewire** has been selected as your Source Input. See **Chapter 7: Livewire Networking** for more on this.

Signal Mode (Non-Microphone Sources)

Determines whether source will be treated as a mono or stereo source.

- **Stereo** feeds incoming L/R signal to left and right channels of assigned bus(es).
- **Left** feeds incoming left channel to both channels of assigned bus(es).
- **Right** feeds incoming right channel to both channels of assigned bus(es).
- **Sum** creates L+R mono mix of incoming stereo source and feeds it to both channels of assigned bus(es).

Signal Phase (Non-Microphone Sources)

Determines whether source will maintain normal or inverted phase relation.

Fader Trim Gain

This setting allows you to specify an amount of gain from -25 to +25 dB. Fader Trim Gain is applied in the signal path just before the fader.

Panorama Position

Lets you preset pan settings for this input. Pan is variable in 49 steps, center being 0, far left -24 and far right +24. This setting can be adjusted on the fly by the operator if permitted by show profile settings.

Equalizer

If the check box is selected, the EQ function is enabled for this source profile. The EQ function provides three band EQ with sdjustment of the frequency of each band and the gain of the band. The QOR has a limit of 8 simultaneous channels with EQ.

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Source Availability

These check boxes determine which faders (or other inputs) you'll allow this source to be assigned to. For example, if your source is a Control Room mic, and you only want it to appear on the left-most fader, you would check only the box marked Channel 1. You might want to make a CD player available on any fader, so you'd check the boxes for all faders.

You might wish to prevent some sources – especially off-air signals – from ever being assigned to a fader, so you would un-check the boxes for all faders.

The two final check boxes, **External** and **V-Mixer**, determine whether the board-op will be able to assign the source directly to the CR monitor and headphone buses, or to the Virtual Mixer.

To prevent a source from appearing on these inputs' selection lists, un-check the relevant box. Generally speaking, you'd want to restrict sources such as computers and CD players to fader assignments while sources such as off-air receivers would be marked to appear only on the External monitor selection list.

Fader Mode

Defines fader start actions and start logic:

- **Normal** conforms to the US method of requiring talent to manually turn the channel on and off.
- **Fader Start** follows the common European standard of activating the channel and associated machine logic when the fader is raised from - ∞.
- **Fader Start with Arm** works just like the Normal setting when the fader is not set to minimum position. When the fader is set to the minimum position, it can be in an Armed state. This armed state is entered by pressing the ON Button when the fader is down. The armed state means that the channel will go to the ON state when the fader is moved up. The channel ON lamp will flash in "wink" mode - a long on-time and short off-time.

Preview Mode

Permits you to choose whether **Preview** acts in CUE (pre-fader) or SOLO (post-fader) mode.

Preview Switching

There are two check boxes in this area. None, either or both may be checked. The options are:

- Channel ON turns Preview OFF
- Preview ON turns Channel OFF

Auto-Start Timer

When this box is checked, the count-up timer will start when the channel is turned ON (timer function only supported in DESQ).

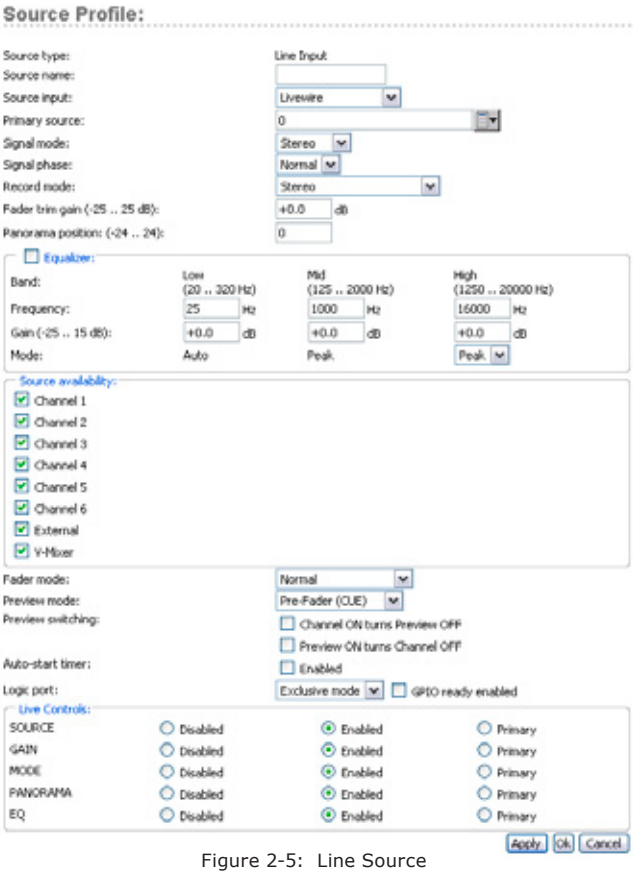

Figure 2-5: Line Source

Logic Port

Allows you disable GPIO machine logic to this audio source device or enable it in two modes. **Exclusive** mode permits GPIO control associated with only a single fader. **Shared** mode allows more than one user to send ON/OFF/START signals to the source via GPIO.

Feed to Source (Codec, Phone, Studio Feed only)

If this source is a Phone or Codec type and there is a

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backfeed associated with it, this option determines what audio content is sent back to the source from the console.

- **Disabled** - No backfeed.
- **Auto (Pgm-1/Phone)** feeds the **Program 1** bus (minus the source) when this source's fader is ON, and feeds the Phone bus (minus the source) when the fader is OFF. Remember, the Phone bus is actually a special variant of Program 2. The Phone bus is pre-fader and pre-on/off to allow speaker-phone style operation thru the Operator's mic.
- **Program 1** always feeds the Program 1 bus, minus the source, regardless of the on/off state of the channel.
- **Program 2** feeds the Program 2 bus, minus the source.
- **Phone** feeds the Phone bus, minus the source. Phone is a pre-fader and pre-on/off variation of Program 4
- **Talk Only** is a "silent backfeed" that operates when the **Talk To** function is engaged, creating an IFB to the source.

Feed to Source Dim Gain (Codec, Phone, and Studio Feed only)

Normally, Talkback is sent over dimmed backfeed audio. If you want a hard interruption (Talkback interrupts Program audio), un-check the **Enable** check box, which mutes the audio. But maybe your jocks would like to have just their program audio dimmed, with Talkback heard over it so they can still monitor air while they're being talked to. In this case, input a value by which the program audio will be dimmed. Adjustment range is 0dB to -30dB.

Live Controls

This group of radio buttons configures permits "live" functions for the **Options** control on each of the console's fader strips. Available options will vary depending on the source type. One setting may be defined as the **Primary** or "live" control, which means that the **Options** control will vary that setting as soon as you adjust the knob. For example, if PANORAMA has been defined as the Primary function, simply rotating the **Options** control will pan the source.

The other functions may be enabled or disabled as desired. Those that are **Enabled** may be chosen by the operator "on-the-fly" by depressing the **Options** control. When the control is pressed, the OLED display will list the options that you've checked as **Enabled** in this section of the configuration. Pressing the **Options** control selects the highlighted option and turning the **Options** control will adjust the parameter for that option. Depending on the enabled options, the operator will be able to adjust Source, Gain, Mode, Pan and Backfeed.

Remember to **save your work**! You may also "Save as Copy" if you intend to set up another, similar source — you can save a few clicks this way.

Congratulations — you've created a Source Profile You can now bring up your new source on a fader.

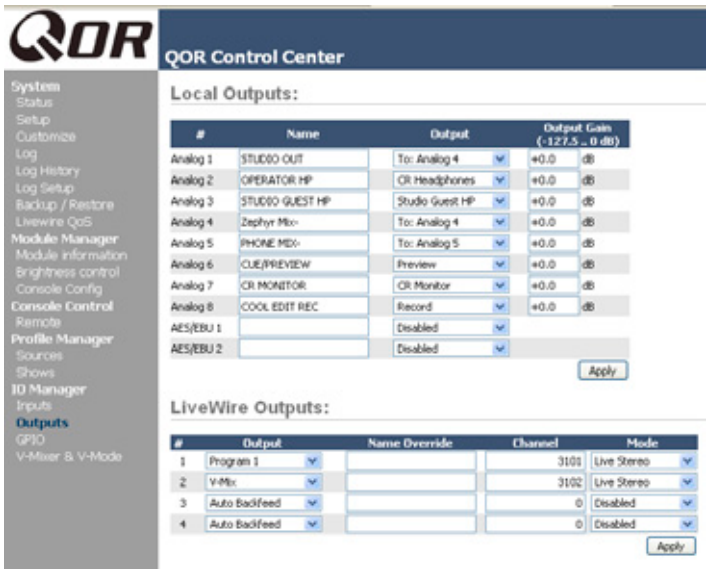

Figure 2-6: Assigning an Output from the list box

QOR Outputs

Now that we have configured sources, let's look at the two kinds of outputs of the QOR, Local and Livewire (network).

- **Local Outputs** - These outputs correspond to the audio connectors on the rear panel of the QOR. These are used to connect Control Room monitors, Preview speakers, headphone amplifiers, record devices and, of course, your air chain equipment and processing.
- Livewire Outputs - This is a group of specified audio

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streams that can be delivered from your QOR

- to other devices in your Livewire network. See **Chapter 7: Livewire Networking** for more details on how this works.

Local Outputs

The QOR.16 has four stereo analog line outputs and one AES output. The QOR.32 has 8 stereo analog line outputs and two AES outputs. These may be configured to deliver:

  - » **Local source** (microphone, analog, or AES/EBU inputs)
  - » **Backfeeds** to any of the above sources that are configured as Phone or Codec.
  - » Any of the **Program** or **Monitor** feeds that are created by the QOR. (CR Monitor, Studio Monitor CR Headphones, VMIX, VMODE, etc)

- **Output** - Using the drop-down menu, select the desired source that you want to deliver to your local output.
- **Output Gain** - The output signal level may be attenuated to provide an optimal level for outboard devices. The gain range is from -127.5 (off) to 0.0 dB (unity gain).

CAUTION - Once you have made a selection and applied it, audio is immediately delivered to the QOR output. Be sure to turn down all amplifier level controls to avoid damaging your precious equipment — especially your ears.

V-Mixer and V-Mode

The V-Mixer is an "auxiliary" mixer that can be used to mix five stereo sources and from this mix, create another new Livewire source that may be used like any other audio source.

V-Mode is a signal converter that allows you to manipulate some mono-mode sources. V-Mode has one input and one output, thus creating one additional source.

V-Mixer and V-Mode outputs are assigned in the QOR **Outputs** section and delivered to your Livewire network. Once V-Mixer and V-Mode signals are a part of the network, they can be loaded on any local or networked console fader, or routed to any other network destination.

V-Mixer Controls

The V-Mixer works independently of the console. Static control of V-Mixer is available through the web pages.

Even though the "V" in V-Mixer stands for "virtual", you can in fact perform a certain amount of "hands-on" mixing. Although you don't have physical control of the virtual faders or virtual ON/OFF switches, adjustments made to the V-Mixer take effect as soon as you apply them. While you may not want to operate an entire show this way, it's valuable to know that V-Mixer changes made "on the fly" will take effect immediately.

At the top is the **V-Mix Master** field. This gives the option to assign a Livewire GPIO channel for control of the VMixer. This channel number also gets assigned to a GPIO port, allowing you to have ON/OFF control of VMix channels through GPIO. The last option applies a gain stage to the final mix the five inputs. If the Logic Port is given a value other than 0, the HTML control of the vmixer will be forfeited.

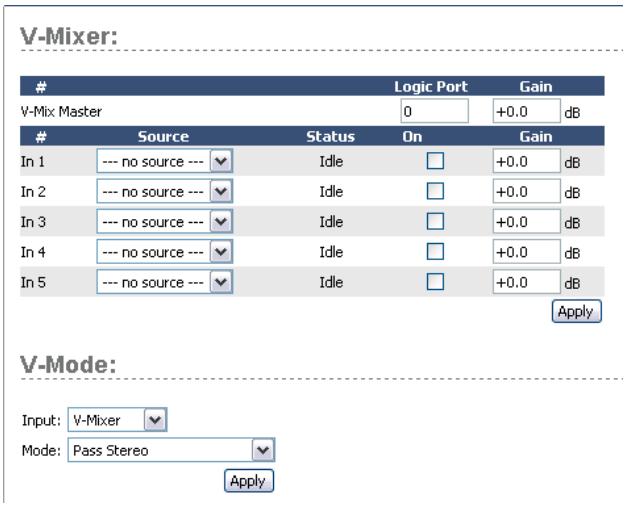

Figure 2-7: V-Mixer and V-Mode

Controls for the V-mixer's input channels include:

- **Source:** From the drop-down menu, you may select

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any source previously defined with a Source Profile.

- **On:** Simply determines the ON/OFF status of the individual V-Mixer channel.
- **Gain:** This setting allows you to specify a gain setting for the channel that will control its mix level. The range is from -80 dB (effectively off) to +10dB. Note that you may also specify a gain setting for the V-Mix Master, which is the output of the V-Mixer.

At the bottom of the V-Mix section is an **Apply** button. Any changes you make will be saved when this button is pressed. Be sure to save your changes.

What does V-Mode do?

All of the program busses of the are stereo. Sometimes, though, special circumstances require only one channel of an audio source, or a mono sum. V-Mode lets you accomplish this easily.

V-Mode Controls

V-Mode allows you to perform special manipulations on a stream. The controls are as follows:

- **Input Selector** contains a drop down menu that allows you to select from a range of sources for each V-Mode input. You may choose from local Core sources and VMIX.
- **Audio Mode** is the magic box that transforms your stereo stream into something else. You may choose from any of the following options:
  - » **Pass Stereo:** Passes the Left and Right channels as is, without modification.
  - » **Mono sum to L:** Creates mono sum and directs it to the Left channel only.
  - » **Mono sum to R:** Creates mono sum and directs it to the Right channel only.
  - » **Combine from left and right:** Creates a dual mono stream by summing the Left and Right channels.

The output of V-Mix and V-Mode channels can be assigned to outputs like any normal audio source.

Adding Backfeeds and GPIO

Since making a mix-minus and mapping contact closures is often done at the same time a new Source Profile is constructed, let's briefly recap those procedures.

Let's say you've connected a hybrid to Analog Input 5 of your QOR. You've constructed a Source Profile for it, and you now want to give it a mix-minus backfeed and set up a GPIO contact closure for the "take" and "drop" functions. Here's how:

1. Make sure that, in your hybrid's Source Profile, the **Source Type** option is set to "Phone" and the **Feed to Source** is set to "Auto (Program 1 / Phone)".
2. Use your Web browser to connect to the Outputs screen (Figure 2-6) and set up the mix-minus for Output #5.

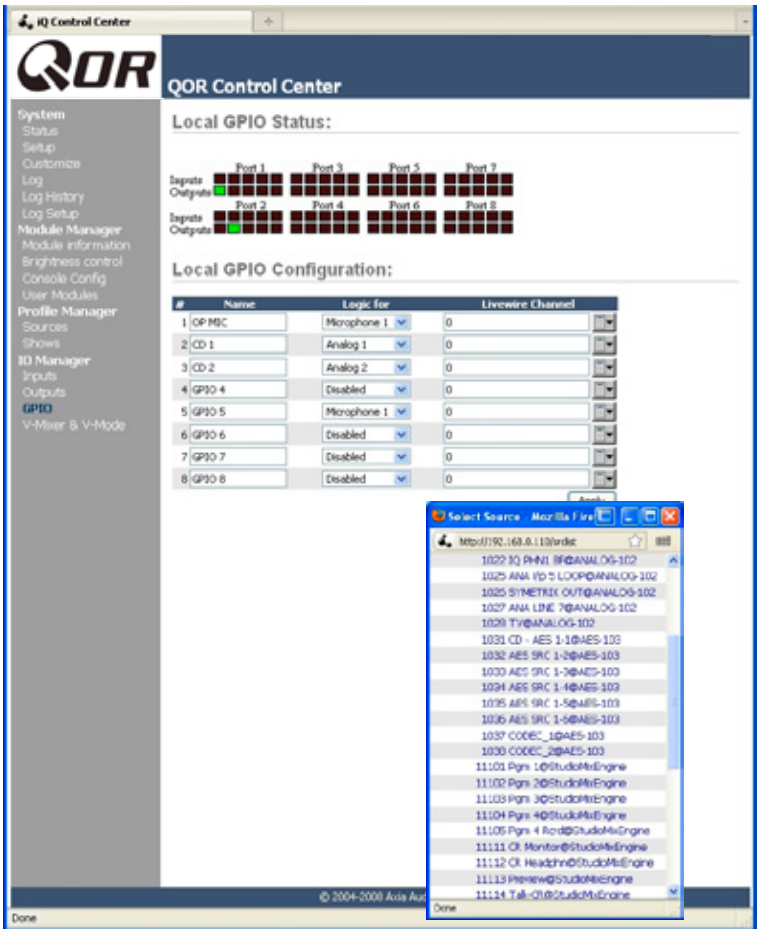

Figure 2-8: GPIO Configuration

3. Just to the right of each **Local Output** name

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box, you'll see a drop-down selector. Click on the drop-down for output #3 and choose **to Analog 5** as shown in Figure 2-6. By simply choosing **to Analog 5**, QOR knows to deliver a backfeed that is a mix-minus of Analog Input 5. (The output chosen to deliver this backfeed is arbitrary - we chose Output 5 just for this example.)

4. Click **Apply**.
5. Now point your browser to the **GPIO Configuration** screen (Figure 2-8). You may also use a GPIO Node in lieu of QOR' built-in GPIO ports; just point your browser to that Node's IP address instead.
6. The GPIO setup screen uses the same method of assigning devices to ports as other Livewire devices. Pick a port to map your Phone channel's contact closures to, using the list tool, and click **Apply**. Figure 2-8 shows the GPIO section of a QOR (Axia Element consoles and GPIO nodes are similar, and also have eight GPIO ports.)

The process is complete: you've made a Source Profile for your phone hybrid, created a mix-minus, mapped it to an audio output, and associated a GPIO port for contact closures associated with the source.

What's Next

When you're ready, join us in **Chapter 3: Console Operation** where we'll show you how to use the various controls of the DESQ and of the RAQ mixing surfaces.

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CAT.6, small and light

yet sound and data pour forth.

What magic is this?.

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Chapter Three:

Console Operation

Overview

RAQ and DESQ are designed to perform well in small studios. The clean interface enhances speed and accuracy without clutter or confusing controls.

In this chapter we'll first give you a high-level overview of the capabilities of the surfaces. Then, we'll give you detailed explanations of the various controls and functions.

Displays

RAQ and DESQ have an OLED display for metering. The meters can be configured to VU or PPM metering standards.

RAQ/DESQ have a dedicated meter displaying Program 1 and the second meter postion can display other buses by pressing the meter button.

In addition to the meter displays, the DESQ has a time of day clock and a count-up timer. RAQ does not have this additional display.

Show Profiles

The RAQ or DESQ can be completely re-configured, instantly, to suit different types of needs. By recalling any of four previously stored Show Profiles, talent can change board settings to suit different needs at the touch of a button.

Show Profiles are easily toggled by pressing the **Profile** key located at the top of Monitor section. Construction and administration of Show Profiles is covered in **Chapter 4: Show Profiles.**

Sources, Channels and Faders

During the course of this chapter, we'll refer often to **sources** and **channels.** *These are not the same!* "Sources" are microphones, CD players, outputs from the playout system, telephone hybrids, etc.

"Channel" would normally be used when referring to DESQ's linear faders or RAQ's rotary faders and associated controls, OLED displays, bus assignment keys, etc.

Sources are assigned to faders for use on-air or in production. During initial configuration, the Source Profiles are programmed by the engineer for appropriate logic and options (as outlined in previous chapters); afterwards, whenever that source is assigned to a fader, source logic follows.

Fader settings are instantly reconfigured whenever a source is selected, to accommodate the unique requirements of the source. For example, a fader controlling a microphone source also controls appropriate monitor mutes. A fader controlling a line source may send "start" and "stop" commands when the channel is turned on and off.

Sources such as an off-air feed can also be assigned directly to the monitors for auditioning without being assigned to a fader.

Mix-Minus

Mix-minus setup, especially for live broadcasts, has always been one of the most confusing aspects of running a radio console. RAQ/DESQ makes mix-minus easy by automating it. The operator never has to worry about sending a source back to itself and getting feedback — it just can't happen!

Several fixed and auto-switching mix-minus choices are possible, and are configured for each source when Source Profiles are defined by the engineer (see **Chapter 2** for details). Once this setup is done, no further tweaking is needed; the operator simply uses the source. A fader's status display tells operators when a particular source has a mix minus output, and even tells them which audio mix is being backfed.

RAQ/DESQ will generate as many mix-minus outputs as there are faders, each with its own automated mix minus feed. Each of your six faders can produce a mix-minus!

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GPIO

Chapter 2 explained how sources can have associated GPIO (General Purpose Input/Output) control associated with them. External GPIO interfaces are connected to QOR via the Livewire network (more details in **Chapter 7**) , so you can locate the actual machine connections either physically close to source equipment or in a central equipment room.

During installation, the engineer configures sources to accept and provide logic commands by selecting various options. For example, studio mics may be set up to automatically mute the studio monitor speakers and illuminate an on-air warning light when turned on. The same sources can be configured to accept GPIO logic inputs from buttons, so that each studio guest can have their own **On, Off, Talk,** and **Mute** keys.

Line sources can be configured to receive *start* and *stop* commands from the QOR as well. Start/stop messages can also be passed, via Ethernet, to a computer-based playout system.

Software

The QOR operating system uses a high-performance embedded Linux kernel to help ensure bulletproof, 24/7 operation. Software updates can be obtained from Axia via the Internet and applied by the station engineer. Axia Support recommends performing backups or making printouts of Show Profiles and other configuration data before applying new software updates.

Callouts and Operation

This section provides a "bird's-eye view" of the RAQ and the DESQ, with full descriptions of controls and their functions.

Although consoles have a fixed number of channels, you are not limited to that number of sources. The RAQ and DESQ control surfaces are laid out in a conventional manner with the monitor and ancillary controls located on the right side of the frame. Let's look at each of these sections in detail.

1. **Channel ON Switch:** The ON key toggles the channel between the ON and OFF states. The channel ON and OFF functions also provide logic (start and stop pulses, monitor muting, etc.) specific to the source type.

For example, if a control-room mic is assigned to a fader, the CR monitors and Preview speakers will mute when that fader is turned on and when CR microphone sources are Previewed.

2. **SOFT Key:** Each channel has a Soft Key. The OLED display tells you what function the soft key is currently controlling. The default action depends upon the type of input assigned to that fader, which is defined in the Source Profile. Current functions of the key are Mute, Talkback and phone hold. This key is also used to exit Channel Options edit mode.

3. **PREVIEW Key:** allows the operator to listen to sources before they air. RAQ/DESQ **Preview** bus allows auditioning in full stereo. Individual source profiles can change Preview to Solo (post-fader) operation.

The **Preview** key acts like a latching switch. *Momentarily* pressing any channel's **Preview** key assigns that channel to the Preview bus; pressing it again removes the channel from Preview. To enable an operator to quickly listen to various sources, the Preview function can be interlocked: pressing **Preview** on any channel will remove any other channel from Preview mode.

If you want to preview multiple channels, pressing and *holding* any **Preview** key temporarily disables the interlock; other sources can be added to the Preview mix by pressing them. Conversely, channels can be removed from a multiple Preview selection by pressing and *holding* any lit **Preview** key and deselecting the individual channels you wish to remove from Preview.

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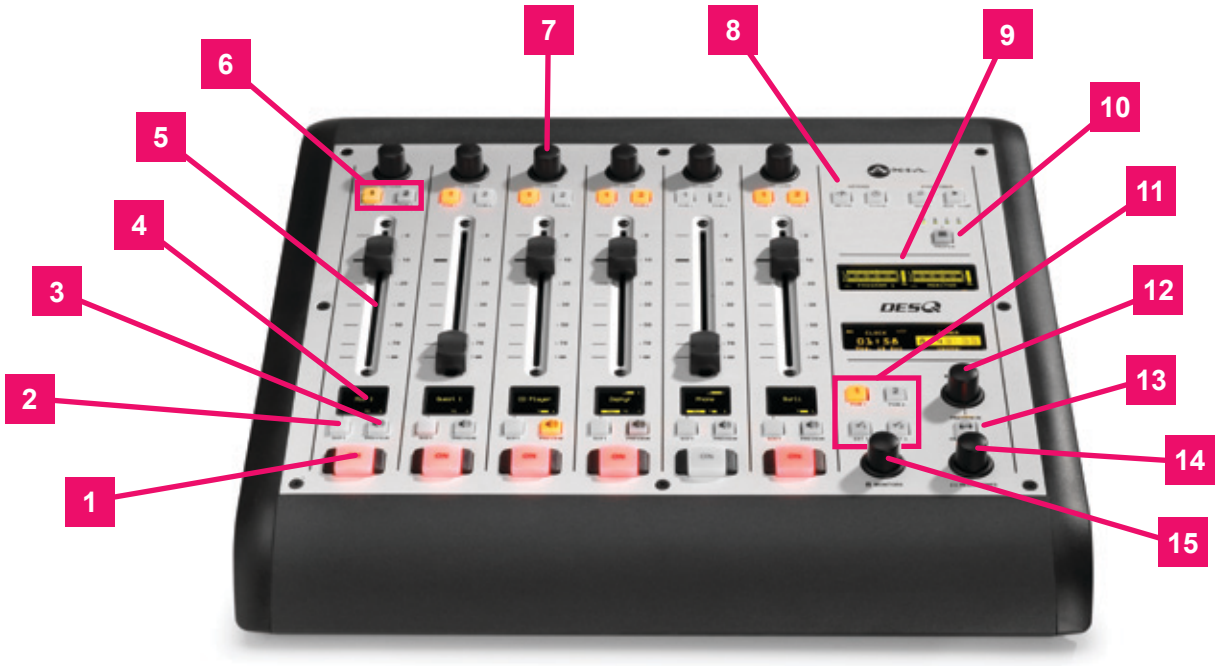

Figure 3-1: DESQ

A *momentary* press of any lit **Preview** key will remove all channels from Preview.

The interlock option for Preview can be disabled in any Show Profile's Monitor section so that users can gang preview sources without the need to press and hold **Preview**.

The audio from the Preview bus feeds any speakers dedicated to Preview, and can also be routed to the operator's headphones and CR monitors if desired. Preview speakers will be muted whenever and CR microphone is **ON**, or is assigned to the Preview bus.

4. **Channel Information Display:** This OLED display interacts with the **Channel Options** control and the **Soft** key. It is context-sensitive and can display many different parameters relevant to each fader. Normally the display will show the name of the source that is applied to the fader ("Zephyr"), and the function assigned to the **SOFT** key ("TALK").

When fader channel parameters are being edited, this display shows gain and pan settings, mode, backfeed selection and other parameters that will be dependent on the type of source.

When viewing these menus, the **Options** control is pressed to select the function, and rotated to set the value.

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Just below the Source name is a status line. It shows the status of a channel. It is displayed in medium font. In the previous example, it is "[TALKBACK]."

Here is a list of the different status displays and their meanings:

» [TALK TO CR] - means that this channel is talking to Control Room. Used on Guest Microphone and Codec source types

» [OP TALKING] - means that this fader is an operator mic and it is currently in use for **Talkback** rather than feeding to Program buses

» [MUTED] - means that this channel is muted

» [TALKBACK] - means that this channel is being talked to, i.e., the talk bus is fed to the backfeed stream for this fader.

» Src-label - If the source has an associated label, it will be shown. Source label is normally used by playout systems to indicate song name and/or important information. Available only for Livewire sources.

» Listen Only - The source was loaded in listen-only mode. No GPIO control is available for this source's originating device.

» Used EW - The source is currently in use elsewhere and is in listen only mode. As soon as source is freed, it will be automatically reloaded in Full Control mode.

» Src Load Err - An error occurred during source loading. Re-load the source.

» No Backfeed - An error occurred during backfeed allocation for the source. For example, no resources are available to allocate backfeed stream.

» Src Waiting - means that a new source is waiting to be loaded. This state is accompanied by a blinking **OFF** key. Turn the channel **OFF** to load the new source.

5. **Fader:** The fader controls the volume of the input source. There are two modes for the fader: **fader-start** and **fader-normal:**

- When the channel is used in **fader-start** mode, pushing the fader all the way to the bottom of its travel turns the module off, and sends appropriate logic commands to source equipment. Moving the fader up turns the channel on and sends logic commands. In **fader-start** mode, the **On** button act more as indicators of channel status; the **On** key will not turn the channel on if the fader is at the bottom of its travel.
- In **fader-normal** mode, the on/off status and start/stop commands follow the channel ON/OFF switch independently of the fader position.

6. **Program Bus Assignment Keys:** Each channel is assigned to any of the two output buses by selecting any (or both) of these program bus keys. Generally, PGM-1 is the main bus and PGM-2 is used for production or other programming requirements. All program outputs are post-fader and post on-off function.

The PGM-2 button also functions to assign a channel to a special Phone bus that is used to send mix-minus audio to any phone callers. These buses operate independently but simultaneously, allowing jocks plenty of operational flexibility. The Phone bus is pre-fader and pre-ON/OFF function.

» **PGM-2** bus audio output is post-fader, post-ON/OFF.

» **PGM-2 Record** bus audio output is post-fader, pre-ON/OFF.

» **Phone** bus audio is sent to callers pre-fader, pre-ON/OFF.

7. **Channel Options Control:** This control operates in conjunction with the OLED fader display. Pushing the rotary encoder selects OPTIONS mode, displaying various choices on the OLED beneath. Rotate to select the desired option, and then push to "take." Once an option has been selected, you can rotate the control again to adjust the value of that parameter (if any). Press the **Soft** key to exit.

In the QOR's Web setup, you can also assign a default function to the rotary encoder. Doing so allows adjustments to fader options, gain trim, input gain

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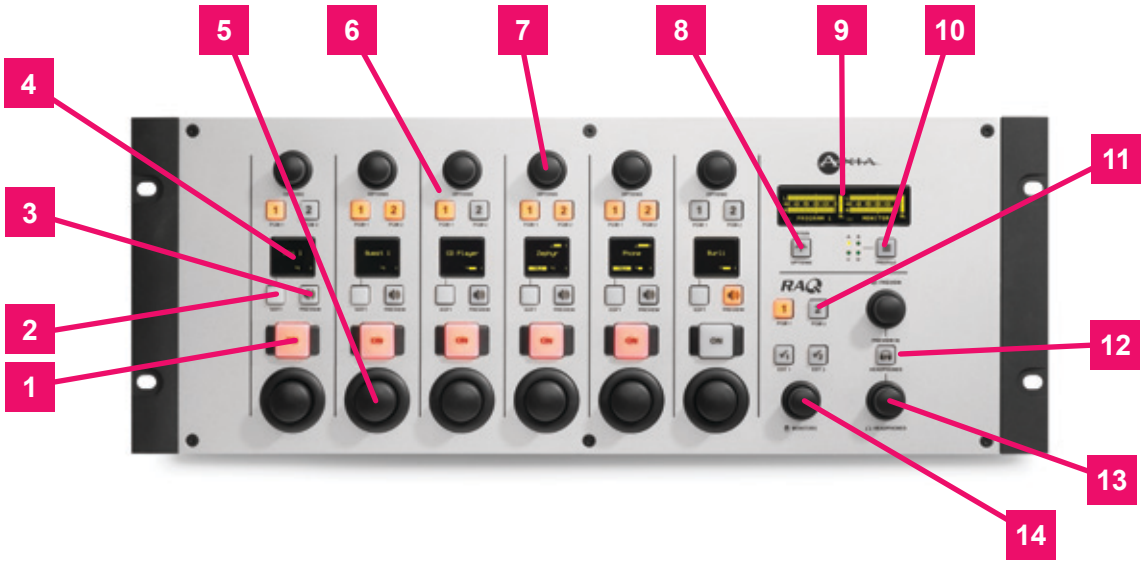

Figure 3-2: RAQ

trim, pan, or input selection to be made just by rotating the knob.

8. **Meter Key:** This key toggles the Soft meter (right side of OLED meter display) between PGM 2, Phone mix, and Monitor.

9. **OLED meter display:** The display by default shows PGM-1 meters and also display another selected meter. When selecting a show profile or making changes to a volume property (Preview, Headphones, Monitor), the right half of the display will provide information to the user of the options or changes made. When the display shows options, use the Preview knob to highlight an option and press the knob in to take.

10. **Profile Key:** This key allows you to select the active Show Profile from a group of four preconfigured profiles. The OLED display shows profile to select from. The Preview knob is used to navigate this screen. To exit this screen, press the Profile key. You can also push and hold the profile key for 5 seconds to reload the current profile.

11. **Control Room Monitor Select Keys:** This group of keys selects the source that is delivered to your control room monitor speakers. The operator may select from PGM 1, PGM 2, or two pre-designated external sources. The external sources are typically used for off-air receivers and are specified in the web page configuration.

External 1 and External 2 have another function, in addition to their normal monitor-select action. If you press and hold one of these keys for 2 seconds, you will see that the meter OLED display and preview knob may be used to assign a source on-the-fly to that specific External Input. Press **Ext 1** or **Ext 2** again to exit this Select mode

12. **PREVIEW Level Control:** Adjusts the volume level of the Preview output connected to your external powered **PREVIEW** speaker. Note that the **PREVIEW** speaker will be muted whenever any CR microphone is **ON**. The preview knob is also used when

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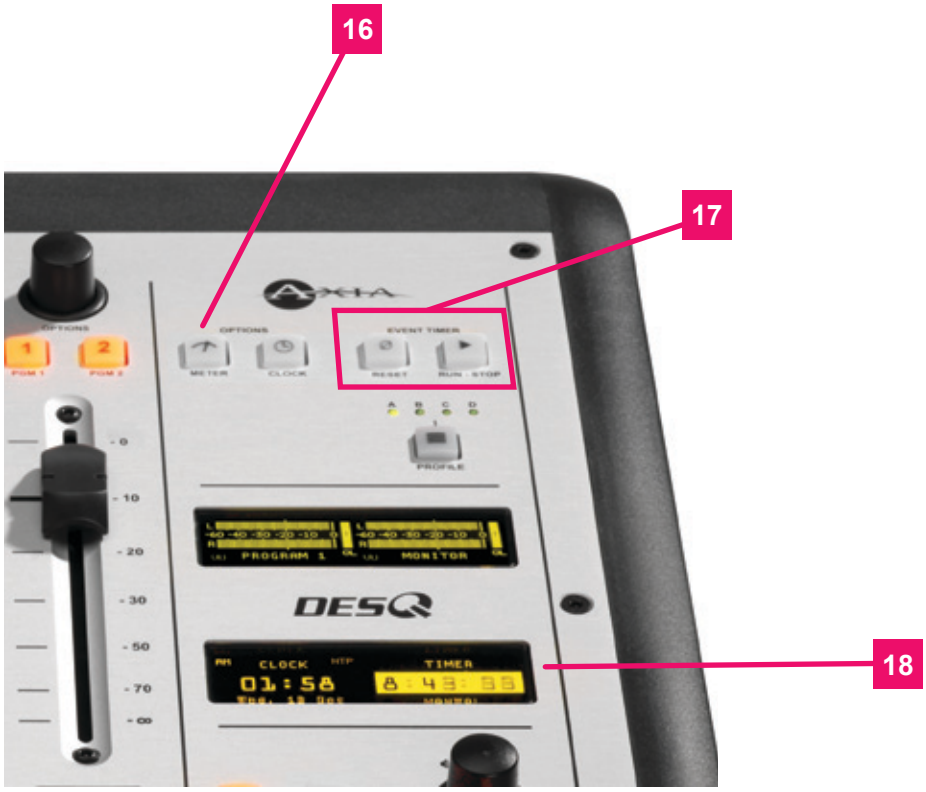

Figure 3-3: DESQ

selecting a show profile change or other optional selection process which will appear on the OLED display.

13. **PREVIEW in HEADPHONE Key:** The **H/P PREV** key controls whether audio from the **Preview** bus will be fed to the board op's headphones, and if so, in what manner. Pressing this key toggles through the following options:

» **Off:** The operator will not hear Preview audio in the headphone channel.

» **ON (Stereo):** audio from the Preview channel overrides the **Headphone Monitor** selection and is sent to both the left and right channels of the operator's headphones.

14. **HEADPHONE Level Control:** Rotate to adjust the Headphone volume. Headphone source follows CR Monitor selection.

15. **MONITOR:** Adjusts the level of your Control Room Monitors. This output will automatically MUTE whenever any Control Room microphone is **ON** or when Record Mode is active

16. **Clock Key (DESQ only):** Pressing this key toggles between AUTO and MANUAL modes for the count-up timer. AUTO allows it to be reset and started by any source starting that has it's timer start option enabled. MANUAL ignores those starts and follows the RUN/STOP/RESET keys only. Note that even if you are set to AUTO, the run/stop/reset keys still work. To set the clock, push and hold the Clock key for 6 seconds to enter clock adjust mode. The Clock key will illuminate indicating that clock setup is active. Release the Clock key and press RUN-STOP to set the clock display forward, and press RESET to set it back. Press the Clock key again to save the current time and exit clock adjust mode. If NTP is active and enabled (via web page configuration), the time cannot be adjusted manually.

17. **Event timer keys (DESQ only):** The Reset key and Run-Stop key control the count up timer as is typical in a stop watch. Run-Stop starts and stop the timer. Reset will set the timer back to zero value.

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18. **Clock OLED (DESQ only):** The display returns the clock time and the timer values.

System Settings

To access System Settings of the QOR, press and hold the Meter key for five seconds.

The meter display shows the options and the preview control is used to navigate, select options and change parameter values

Options available are:

- **IP Address**
- **Subnet Mask**
- **Gateway**
- **Save and Reboot**

Source-Specific Channel Controls

Some fader functions change their behavior to suit the type of source assigned to the fader. A Guest Mic input has unique functions different from those of a Codec input, and so forth. In this section we'll explain the channel functions unique to each type of source input.

Control Room Operator Mic Channel

The Control Room Operator microphone is the board operator's mic. It's always located in the Control Room, so activating a channel designated as the CR Operator mic affects CR Monitor speaker and Preview speaker muting.

When the board operator pushes a **Talkback** key, all output bus assignments for the Control Room Operator microphone are temporarily muted, while his mic's audio is routed to the requested **Talkback** destination. Releasing the key returns the channel outputs to normal.

Pressing the soft key for the CR Operator Mic while the channel is already on will mute the channel until the key is released, acting as a "**cough**" function for the board operator. On-air status and speaker mutes are unaffected by this action. The CR Operator microphone channel will mute the CR Monitors (Monitor 1) and the Preview speakers whenever the channel is **On,** or if **Preview** keys are selected.

Control Room Guest Microphone Channel

There are often microphones in the Control Room other than the board operator's; i.e., an in-studio guest or perhaps an announcer located physically near the board op. These microphones also control the muting of the Control Room monitor speakers.

Control Room Guest Microphone channels will mute the Control Room speakers and the Preview speakers whenever the channel is **ON,** or if **Preview** key is selected.

Line Channel

Line-level devices like CD players, tape players, etc., use the Line Channel profile. The Line Channel is stereo, but the user can change the input mode to mono, left only or right only by using the **Pan & Mode Options** section.

Line channels have a variety of remote logic functions available at the GPIO interface. **ON** and **OFF** states can be remotely controlled, as well as the **Preview** key. Each function has a corresponding lamp driver.

Phone Channel

The Phone Channel profile is used, naturally, for telephone hybrid audio sources. Each Phone Channel has its own discrete Feed-to-Source mix-minus output.

Each RAQ/DESQ can accommodate six automatically-generated mix-minus feeds (one per channel). If the Feed-to-Source mode is set to "Auto", (the most common option - see **Chapter 2: Inputs and Outputs** for the section entitled "Source Profile Options"), phone callers hear the output of the **Program-1** bus, minus himself, when the channels they're assigned to are **ON**. When the caller's channel is **OFF**, callers hear the output of Phone bus (Pre-fader, pre-ON/OFF of channels assigned to PGM-2).

Phone feed-to-source outputs can also be locked to backfeed only **PGM-1**, **PGM-2** using the options provided when constructing the Source Profile for your hybrid.

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This automatic switching mode makes it very easy to prep callers and then seamlessly take them to air with a minimum of key pushes.

Codec Channel

The Codec Channel is used for codec sources. Like the Phone Channel, each codec source is brought up on its own channel, and an individual Feed-to-Source (mix minus) output is provided for each codec. Codec Channels can be turned on and off remotely and provide on/off status to a remote logic device. **Remote Talk** and **Remote Mute** are also provided, allowing talent to take control using their own On/Off/Mute/Talk panels.

Talk enables remote talent to communicate with the board op using the **Talkback** bus. When **Talk** is activated, all outputs for that channel are muted and the source audio is fed to the **Talkback** bus; the channel's **OLED** displays `TALK to CR`. When the user stops talking, the channel returns to normal.

When the operator uses the Softkey to talk to the phone or codec source, the OLED displays `TALKBACK`.

When the remote mute function is activated, the OLED displays `MUTED` and all the channel outputs are muted until the command is released.

The mix-minus output (configured in the Source Profile section) normally feeds **Program-1** audio to the remote, but can be switched to **Program-2** or **Phone**. The Feed-to-Source output on a Codec Channel is a dual mono output, occupying both sides of the stereo pair. The Left output is normally used for remote talent's headphone feed, and is interrupted by **Talkback** audio when the board op talks to the remote. The Right output sends uninterrupted program audio (without talkback) for use as a PA feed.

Remote Control

Console channels can be turned on and off remotely, and will provide on/off status to a remote logic device. **Remote Preview** is also provided, as are lamp drivers for **On, Off** and **Preview. Start** and **Stop** pulses can be sent when the channel is turned on or off, respectively. See **Chapter 5: Configuring GPIO** for detailed information interfacing to GPIO inputs and outputs.

What's Next

Now that you're familiar with RAQ/DESQ controls, let's learn to tap the power of Show Profiles.

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Chapter Four:

Show Profiles

If you've read **Chapter 2: Inputs and Outputs**, you already have a good understanding of Source Profiles. In the same way that Source Profiles allow you to determine how an individual channel is configured when a source is loaded to a fader, Show Profiles let you build configuration files that determine how the entire console behaves, which sources are loaded, and what channels they appear on — "snapshots" that you can load at will to recall baseline show settings.

You can save and recall up to four unique Show Profiles to customize the RAQ and DESQ for different conditions.

Creating A Show Profile

Build A Show

QOR's Web interface, which you've used to construct Source Profiles, is also used to help build Show Profiles, so make sure a computer connected to your QOR or Livewire network.

The first step in building a Show Profile is to set up a RAQ or DESQ using the Channel Options, Monitor and Headphone options as described in **Chapter 3**. Get started by assigning a source to each QOR fader using the **Options** knobs at the top of each channel.

After you've assigned a source for each fader, you can configure the rest of the Channel Options:

- Gain,
- Pan / Balance,
- Feed to Source.

When you've configured all Channel Options, continue on and make monitor and headphone selections since these are all saved in Show Profiles as well.

When you've got the board configured to your satisfaction, proceed to the next section.

Capture It!

It's now time to save your configuration as a Show Profile. Enter your QOR's IP address in your Web browser. When the Main Menu appears, choose **Shows** on the sidebar menu. This is where you'll come whenever you need to capture, construct or administer a Show Profile.

Under the Show Profiles list, you'll find four profiles listed with three options for each Show Profile:

- **Edit.** Choose this option to manually edit any existing show profiles.
- **Capture.** Takes a "snapshot" of the current control surface state and saves it for recall. This is the option we'll use in just a moment.
- **Reset.** Choose this option when you want to construct an entire Show Profile completely from scratch and reset all parameters to their default state or value.

You've already set up your control surface, so now you can just "capture" your settings for further use. Choose **Capture** from the menu. You are allowed to store four Show Profiles which are saved as A, B, C and D. You may also give meaningful names to these Show Profiles as described in the next section.

There may be a few more options you'd like to tweak, since not all options are accessible from the console itself. Let's go a little deeper into Show Profiles to find out exactly what's available to you.

Show Profile Options

Although the ability to create Show Profiles using the "capture" function is powerful, there are a few more options available exclusively via the QOR Web interface. You will probably find that a combination of console setup, capture and edit works best.

When you select any Show Profile, you will enter the edit screen as shown in Figure 4-2. Notice that there is a section for the faders, as well as sections for Monitors

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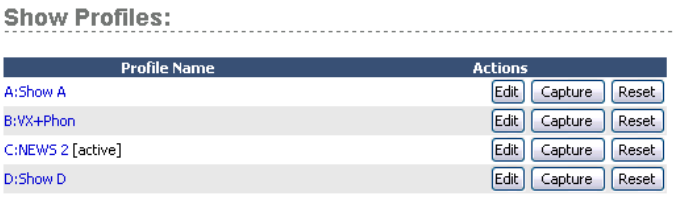

Figure 4-1: Show Profiles screen

and External Inputs and some general user interface settings. At the very top of the page is the **Show Name**. Use this to give the Profile a descriptive appellation

We will now look at the individual Show Profile settings in detail.

Fader Channels

This section has settings for each fader channel. When this specific Show Profile is loaded, these settings will be applied.

- **SOURCE:** You can change the source using the drop-down box. The name of the source you assign will be displayed on the OLED below the fader.
- **ON/OFF:** Specifies the channel ON/OFF state when the profile is loaded.
- **PGM1/2:** Determines the default bus assignments for this channel when the Show Profile is loaded. When a check-box is selected, the source will be assigned to the corresponding bus.
- **Group Start:** There are three possible settings:
  - » **Independent** - this fader is not associated with any other fader and operates independently
  - » **Master** - is used to select one fader as the master for group starts.
  - » **Slave** - is used to select one or more faders as Slaves that will follow the action of the fader that has been designated as the Master.

Monitor Section

- **Volume (-85..0 dB):** You may specify initial volume settings for the outputs listed below. The default setting is full mute:
  - » CR Monitor
  - » CR Headphones
  - » Preview
- **Volume Adjust:** This checkbox determines whether you will permit the operator to change the volume settings for the outputs listed below — useful for locking a console into a certain state during unattended operation. "Allowed" is checked by default.
  - » CR Monitor
  - » CR Headphones
  - » Preview
- **Dim Gain (-30..0 dB):** You may adjust the Dim Gain independently for CR Monitor, CR Headphones. This determines the amount of dimming that will be applied when Talkback is directed to one of these outputs. The default setting is -12.0 dB.
- **Mute Gain (-85..0 dB):** You can specify the amount of attenuation that takes place during a Mute function. The default is full mute. Mute can be applied to CR monitor, Preview but it is not applied to CR Headphones.
- **Source:** Selects the default source for CR Monitor. Available options are Program 1/2 and External 1/2.
- **Source Selection:** You may prevent the operator or studio talent from changing their CR Monitor or source if the corresponding "Allowed" check box is unchecked.
- **Preview In:** determines whether or not Preview will be heard in CR Monitor or CR Headphones in addition to the Preview source.
- **Logic Port:** Use this to specify the Livewire channel number assigned to logic ports (GPIO) used for CR Monitor. These GPIO ports are used for on-air lights and other functions as described in the GPIO tables. Please refer to **Chapter 5: Configuring GPIO** for more details.

External Inputs

- **Source:** Lets you specify two External sources for monitoring purposes plus one source that is an External Preview source. Note that the drop-down selector displays all sources that have been defined as sources in the Source Profile manager.

What's External Preview for? "External" refers here to any source not generated inside the studio you're working in. Let's say you have a Talkback source that you want to feed to the console's Preview speaker. To do this, you would setup a source profile for the Talkback audio and specify that source as External Preview

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User Interface

Several global settings are defined in this section. Remember that even though these are general settings, they are specific to each Show Profile so you may accommodate the unique requirements of different shows.

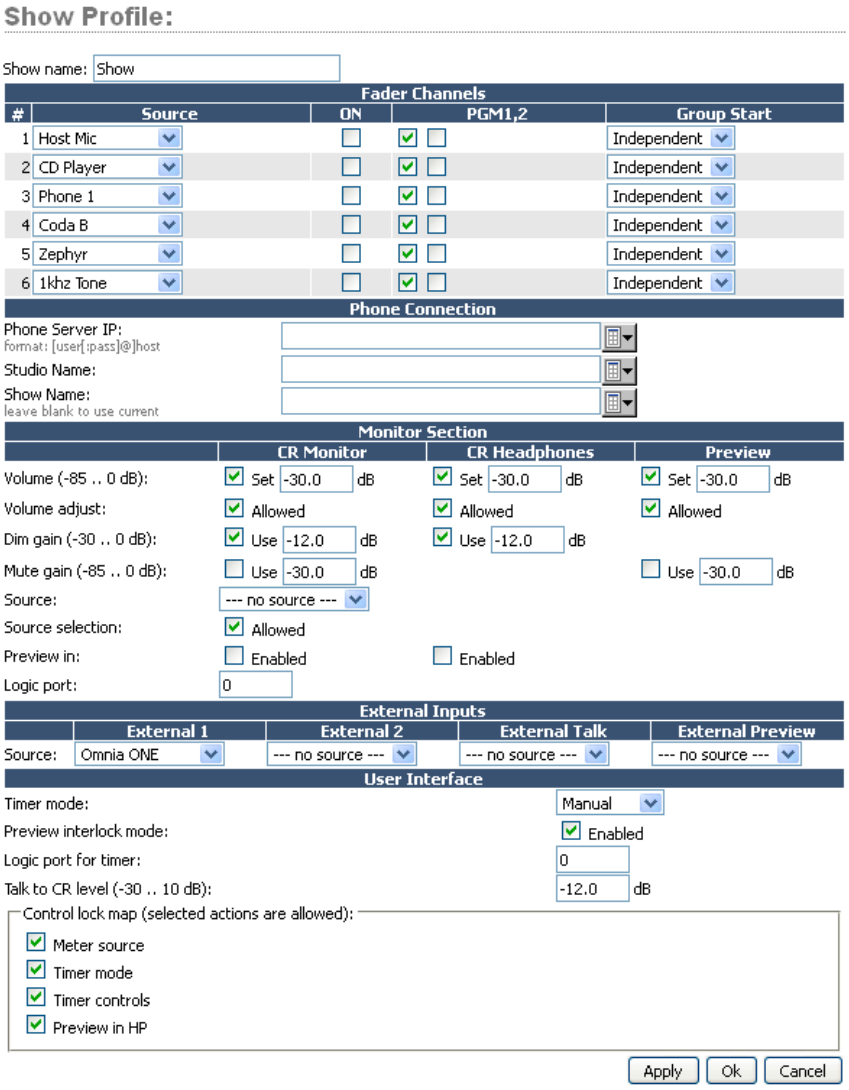
Show Profile:
Show name: Show
Fader Channels
Source ON PGM1,2 Group Start
1 Host Mic Independent
2 CD Player Independent
3 Phone 1 Independent
4 Coda B Independent
5 Zephyr Independent
6 1khz Tone Independent
Phone Connection
Phone Server IP:
format: [user[:pass]@]host
Studio Name:
Show Name:
leave blank to use current
Monitor Section
CR Monitor CR Headphones Preview
Volume (-85 .. 0 dB): Set -30.0 dB Set -30.0 dB Set -30.0 dB
Volume adjust: Allowed Allowed Allowed
Dim gain (-30 .. 0 dB): Use -12.0 dB Use -12.0 dB
Mute gain (-85 .. 0 dB): Use -30.0 dB Use -30.0 dB
Source: --- no source ---
Source selection: Allowed
Preview in: Enabled Enabled
Logic port: 0
External Inputs
External 1 External 2 External Talk External Preview
Source: Omnia ONE --- no source --- --- no source --- --- no source ---
User Interface
Timer mode: Manual
Preview interlock mode: Enabled
Logic port for timer: 0
Talk to CR level (-30 .. 10 dB): -12.0 dB
Control lock map (selected actions are allowed):
Meter source
Timer mode
Timer controls
Preview in HP
Apply Ok Cancel

Figure 4-2: Show Profile Options

- **Timer Mode (DESQ):** is used to specify the default timer mode - manual or automatic. In automatic, the timer may be started by turning a channel ON.
- **Preview Interlock Mode:** If **Enable** is checked, pressing any fader's Preview key causes any other, previously-lit Preview key to be extinguished, removing that source from Preview**.** The board operator can assign multiple faders to Preview by pushing and holding any lit Preview key while pushing other Preview keys to add or subtract. If unchecked, each Preview key works like a press-on, press-off latching switch. Multiple faders can be assigned to Preview simply by pushing once; a second push cancels any individual Preview assignment.
- **Switchable Meter Source:** The second meter is a "soft" meter. The desired default may be selected from the drop-down menu. Choices are: **Program 2**, **Phone mix** or **Follow Monitor**
- **Logic Port for Timer:** Enter the Channel Number of the GPIO port you wish to use for external control of your Count-Up timer.
- **Talk to CR Level: Use** up to -30 dB attenuation or 10 dB gain on the contents of the Talkback bus.
- **Control Lock Map:** This section includes several check boxes. When a box is checked, the selected actions are allowed. Any unchecked boxes will prohibit the operator from accessing these functions when this Show Profile is loaded. The selections are:
  - » Meter Source
  - » Timer Mode
  - » Timer Controls
  - » Preview in HP

As usual, please remember to hit **Apply** when you are done to save your changes.

External Talk

If the console is installed in a Control Room where the operator will not go "live" with a mic, this option saves you from the need to assign the Operator Mic source type to a fader for Talkback to Codecs or Phones.

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Assign the appropriate source to External Talk, and with no Operator mic loaded to a channel, the operator can still engage Talk functions to backfeeds.

What's Next?

We have mentioned GPIO many times in the preceding chapters. Join us in Chapter 5 to learn how to interface the logic functions with the real world.

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Chapter Five:

Configuring GPIO

This chapter explains how to set up QOR GPIO. We also invite you to read the **GPIO Node User's Manual**, for more in-depth information on the topic of GPIO.

GPIO Port Definitions

The QOR.16 has four DA-15 connectors and the QOR.32 has 8 DA-15 on the back panel. Each connector (also known as a GPIO port) can be associated with a device in your studio, and provides five opto-isolated inputs and five opto-isolated outputs per device for machine control, lamp drives and remote channel controls. GPIO ports can also be monitored and controlled by our PathfinderPC software.

GPIO ports are programmed to support several different types of devices. How does a GPIO port "know" which type of device is assigned to it?

Back in Chapter 2, when you constructed a Source Profile for a telephone hybrid, you defined the source type (see "Adding Backfeeds and GPIO to a Source Profile"). This is important, because when that source is assigned to a console fader, this Source Profile selection defines the GPIO port what sort of command to send to the attached device.

If the Source Profile is a microphone, it tells the GPIO Node to send logic for **On, Off, Remote Mute** and Remote **Talk** commands on the appropriate pins. A line input, the GPIO port sends **Start, Stop** and **Reset** commands, plus closures for **Ready** lights, etc.

Axia GPIO ports can deliver unique command sets for the following types of devices:

1. Mic (Operator, Guest, Producer)
2. Line Input
3. Codec
4. Telephone Hybrid
5. Computer Playback Device
6. Control Room Monitor

The next few pages contain tables that explain what function the pins provide in each different device mode.

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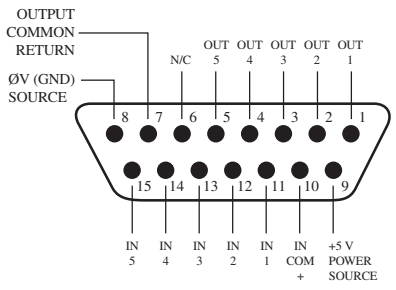
GPIO Operator's Microphone Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turn channel OFF
TALK (to Monitor 2) Command	13	Active Low Input	Activates the TALK TO MON2 function and routes mic audio to the Talkback bus.
MUTE Command	14	Active Low Input	Mutes channel outputs
TALK (to PREVIEWED SOURCE) Command	15	Active Low Input	Activates the TALK button on every source currently in preview and routes mic audio to the Talkback bus.
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE is active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
TALK (to Monitor 2) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK TO MON2 is active
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
TALK (to PREVIEWED SOURCE) Lamp	5	Open Collector to Logic Common Return	Illuminates when TALK to PREVIEWED SOURCE is active.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic +5 Volt Supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Input Common	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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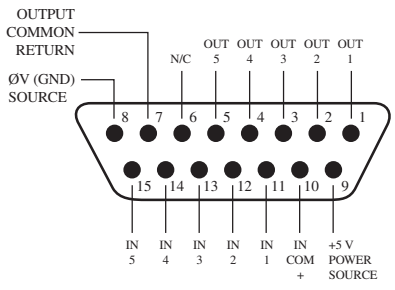
GPIO Control Room Guest Microphone Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turn channel OFF
TALK (to CR) Command	13	Active Low Input	Mutes channel outputs and routes source audio to PVW speakers
MUTE Command	14	Active Low Input	Mutes channel outputs
NOT CONNECTED	15		
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE is active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
TALK (to CR) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK is active
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
NOT CONNECTED	5		
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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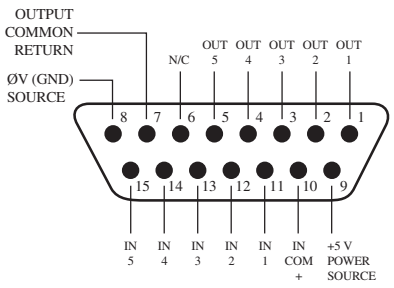
GPIO Producer's Microphone Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turn channel OFF
TALK (to MONITOR 2) Command	13	Active Low Input	Activates the TALK to MON2 function and routes mic audio to the Talkback bus.
MUTE Command	14	Active Low Input	Mutes channel outputs
TALK (to PREVIEWED SOURCE) Command	15	Active Low Input	Activates the TALK button on every source currently in Preview and routes mic audio to the Talkback bus.
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE is active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
TALK (to MONITOR 2) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK to MON2 is active.
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
TALK (to PREVIEWED SOURCE) Lamp	5	Open Collector to Logic Common Return	Illuminates when TALK to PREVIEWED SOURCE is active.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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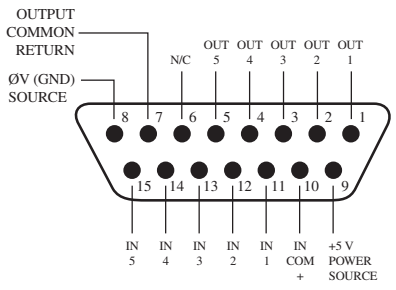
GPIO Line Input Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF & sends 100 msec STOP pulse
PREVIEW Command	13	Active Low Input	Turns preview ON
RESET Command	14	Active Low Input	Turns channel OFF, while not sending a STOP pulse
READY Command	15	Active Low Input	Illuminates OFF lamp to indicate source's readiness
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF and READY is active
PREVIEW Lamp	3	Open Collector to Logic Common Return	Illuminates when PREVIEW is ON
START Pulse	4	Open Collector to Logic Common Return	A 100 msec pulse when the channel status changes from OFF to ON
STOP Pulse	5	Open Collector to Logic Common Return	A 100 msec pulse when the channel status changes from ON to OFF
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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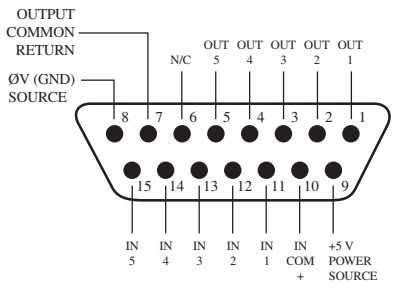
GPIO Codec Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF
TALK (to CR) Command	13	Active Low Input	Mutes channel outputs and routes source audio to PVW speakers
MUTE Command	14	Active Low Input	Mutes channel outputs
TALK (to SOURCE) Command	15	Active Low Input	Allows an external button to activate channel TALK TO SOURCE function.
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE are active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF.
TALK (to CR) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK is active
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
TALK (to SOURCE) Lamp	5	Open Collector to Logic Common Return	Illuminates when the channel TALK TO SOURCE function is active.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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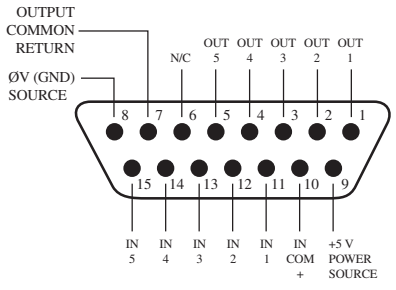
GPIO Telephone Hybrid Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF
PREVIEW Command	13	Active Low Input	Turns preview ON
RESET Command	14	Active Low Input	Turns channel off while not sending a STOP pulse
READY Command	15	Active Low Input	Illuminates OFF lamp to indicate source's readiness
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
PREVIEW Lamp	3	Open Collector to Logic Common Return	Illuminates when PREVIEW is ON
START Pulse	4	Open Collector to Logic Common Return	A 100 ms PULSE is sent when channel is first turned ON or when PVW is first selected
STOP Pulse	5	Open Collector to Logic Common Return	A 100 ms PULSE sent when channel is turned OFF.
POWER & COMMAND			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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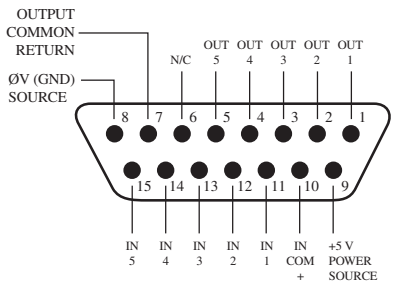
GPIO Control Room Monitor Logic

Name	Pin	Type	Notes
INPUTS			
MUTE CR Command	11	Active Low Input	Mutes CR monitors and Preview speakers
DIM CR Command	12	Active Low Input	Allows external dimming of CR monitor speakers.
Enable EXT PREVIEW Command	13	Active Low Input	Feeds External Audio Input to PREVIEW
TALK TO EXT Command	14	Active Low Input	Turns on Talk to External Audio.
Not used.	15	Active Low Input	
OUTPUTS			
CR ON AIR Lamp	1	Open Collector to Logic Common Return	Illuminates whenever CR monitors are muted
DIM CR Lamp	2	Open Collector to Logic Common Return	Illuminates whenever control room monitors are DIMMED
PREVIEW Lamp	3	Open Collector to Logic Common Return	Illuminates when PREVIEW is active.
TALK TO EXT Lamp	4	Open Collector to Logic Common Return	Illuminates when Talk to External is active.
TALK (to CR) Active Lamp	5	Open Collector to Logic Common Return	Active whenever a source has activated its TALK (to CR) function
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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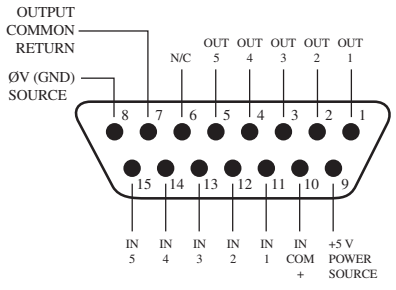
GPIO Computer Playback Device Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF & sends 100 msec STOP pulse
PREVIEW Command	13	Active Low Input	Turns preview ON
Not Used	14	Active Low Input	
READY Command	15	Active Low Input	Illuminates OFF lamp to indicate source's readiness
OUTPUTS			
NEXT Pulse	1	Open Collector to Logic Common Return	A 100 mS PULSE sent when ON button is depressed, except when initially turned ON.
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF and READY is active
PREVIEW Lamp	3	Open Collector to Logic Common Return	Illuminates when PREVIEW is ON
START Pulse	4	Open Collector to Logic Common Return	A 100 ms PULSE sent when channel is first turned ON.
STOP Pulse	5	Open Collector to Logic Common Return	A 100 ms PULSE sent when channel is turned OFF.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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Assigning GPIO to a Source

As you've seen by studying the previous pages, a lot of the work of assigning logic to a source is done for you; once a GPIO port is linked with a Source Profile, all that remains to do is to solder cables connecting the GPIO's DA-15 connectors to the device's control interface.

So, how *do* you link a GPIO port with a Source Profile? It's very easy; let's do it step-by-step.

> ***Note:*** This procedure assumes that you have already defined at least one Source Profile using the instructions outlined in Chapter 2.

1. Open your Web browser and enter the IP address of QOR. Choose **GPIO Configuration** from menu. Enter your password if prompted (default login is "user", leave the password field blank).

2. If you haven't previously assigned any GPIO ports, the GPIO definitions screen will be blank. Notice the status indicators at the top of the page, showing the state of the input and output pins of each port. The "Logic for" option defines how the port will be used.
   - » **LWRP:** The port will only be controlled through a control protocol. Software packages, as in Pathfinder use the protocol.
   - » **LIVEWIRE:** Specify a channel number and the port will follow the logic associated with that channel (this will be used for CR monitor logic)
   - » **SPECIFIED INPUT:** Define an input port and the port will follow the logic of that input.

Local GPIO Configuration:

#	Name	Logic for	Livewire Channel
1	ON AIR	LWRP	0
2	RECORD	Livewire	3111
3	PHONE	Analog 5	0
4	GPIO 4	Analog 7	0
5	AV play1	Livewire	999
6	GPIO 6	AES/EBU 1	0
7	GPIO 7	Livewire	111
8	GPIO 8	LWRP	0

Figure 5-1: GPIO Port Assignment

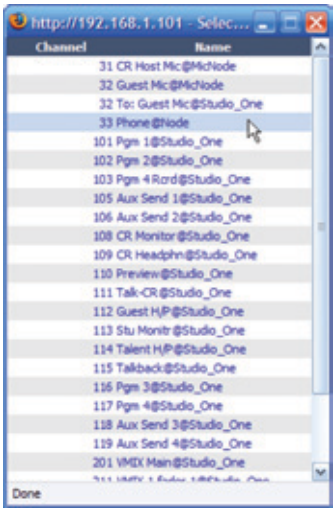

Figure 5-2: GPIO Select Source popup list

3. If using the **LIVEWIRE** option, you will need to specify the Channel Number in the **Livewire Channel** column. You can do this by manually entering the number, or browsing the network for an advertised Livewire channel. When you click on any list icon, a small popup window will open, enumerating all of the audio sources available on the Livewire network (Figure 5-2). Choose the source you wish to associate with a GPIO port by clicking on it; the window will close and the source's name and channel number will appear in the **Channel** box.

If you're using a local source, specify the input. If a source profile has been created to control a phone hybrid using Analog 5 as the input, select Analog 5 in the drop down list. The functions of the GPIO port will now follow those shown in the Hybrid Logic Chart.

4. Type a descriptive name in the **Name** field, and click on the **Apply** button.

Figure 5-3: Pin status indicators showing GPIO port activity

5. The source we've been using for this demonstration is a telephone hybrid; we can now observe the pin status indicators change as we turn the channel on and off, as shown in Figure 5-3.

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Referring to the Hybrid Logic Chart, we can see that when the channel is **Off**, the indicator representing Output Pin 2 – the **Off Lamp** logic command – is high. Turning the channel **On**, we see Pin 4 pulse briefly before Pin 1 goes high: the GPIO has just sent a **Start** pulse, then lit the **On** Lamp. If you turn the channel **Off** again, you'll observe a **Stop** pulse, and the **Off Lamp** command once again becomes active.

See how easy that was? Simply assigning an existing audio source to a GPIO port automagically configures the port for the type of device supplying the audio, and send the appropriate logic commands to that port when the source is assigned to a channel.

Connections to GPIO Ports

Input Connections

Current on these inputs must be limited to 20 mA or less, through the use of a current-limiting resistor. An external power source (24 volts DC maximum) is recommended for all inputs and outputs, to prevent ground loops between equipment. However, if customer equipment is completely isolated, using power from the GPIO port connectors is acceptable. Figure 5-4 shows details for both types of connections:

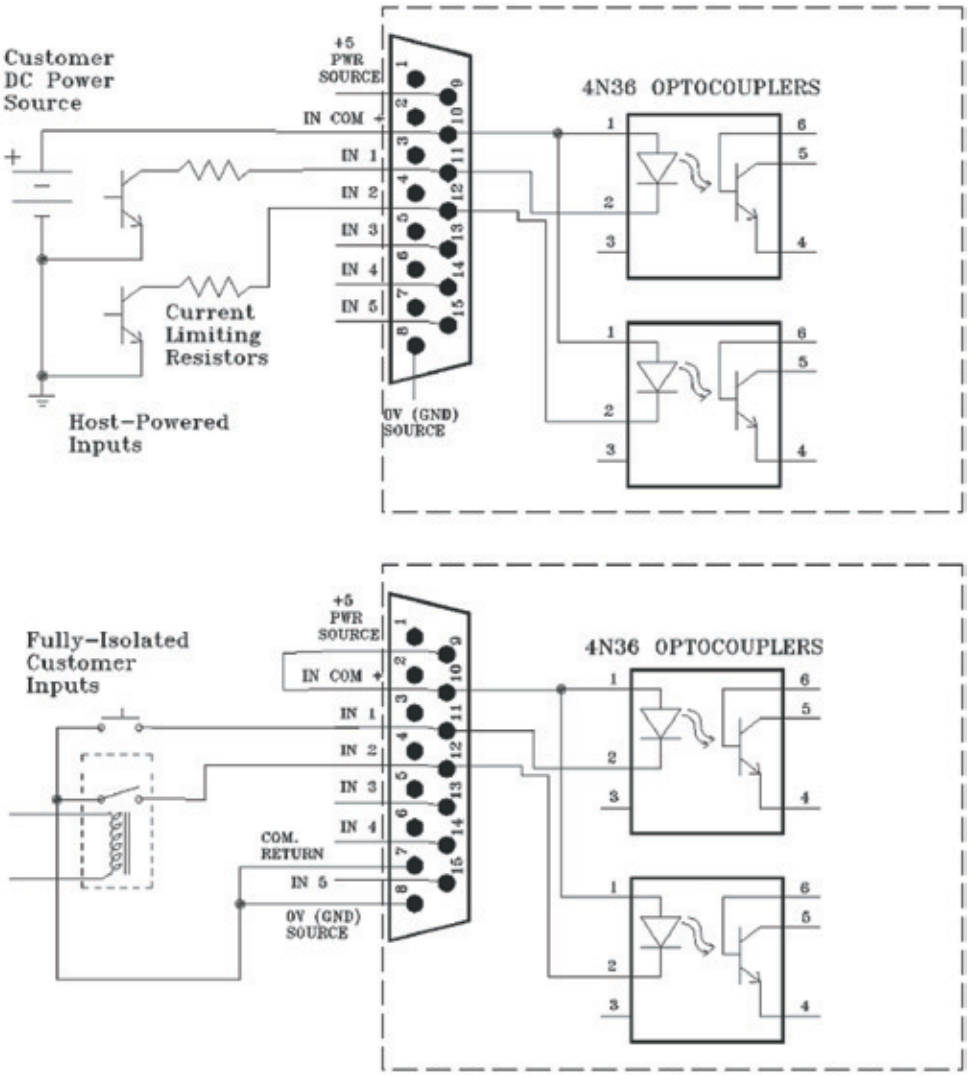

Figure 5-4 GPIO input connections

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Output Connections

The GPIO port's outputs are opto-isolated. Current should be limited 100 mA through each output, with the total current draw from the +5 Volt supply not to exceed 3 amps. Figure 5-5 shows the recommended connections for outputs:

NOTE: Some external devices will allow a logic control input "sink to ground" to activate. Thus, some devices may not work with an Axia GPO control, because they may not fully achieve ground through the output transistor. The voltage drop between the collector and emitter may not be low enough to activate the device, so an external relay controlled by the GPO may need to be used to provide a "dry" contact closure to the external device.

Please note that this section is provided as a "jump-start" introduction to Axia GPIO nodes. For a fuller understanding of the GPIO node's options and requirements, you may wish to read the GPIO Node User's Manual.

Virtual GPIO

Virtual GPIO ports allow you to to avoid having to wire a GPO pin to a GPI pin in order to achieve a particular function. The Virtual GPIO ports provide an ability to define up to five GPO pins that can be "virtually wired" to a single GPI pin. Typically this is used in cases where you want a GPO function to trigger a different GPI function. Please refer to the GPIO tables to determine what those functions are.

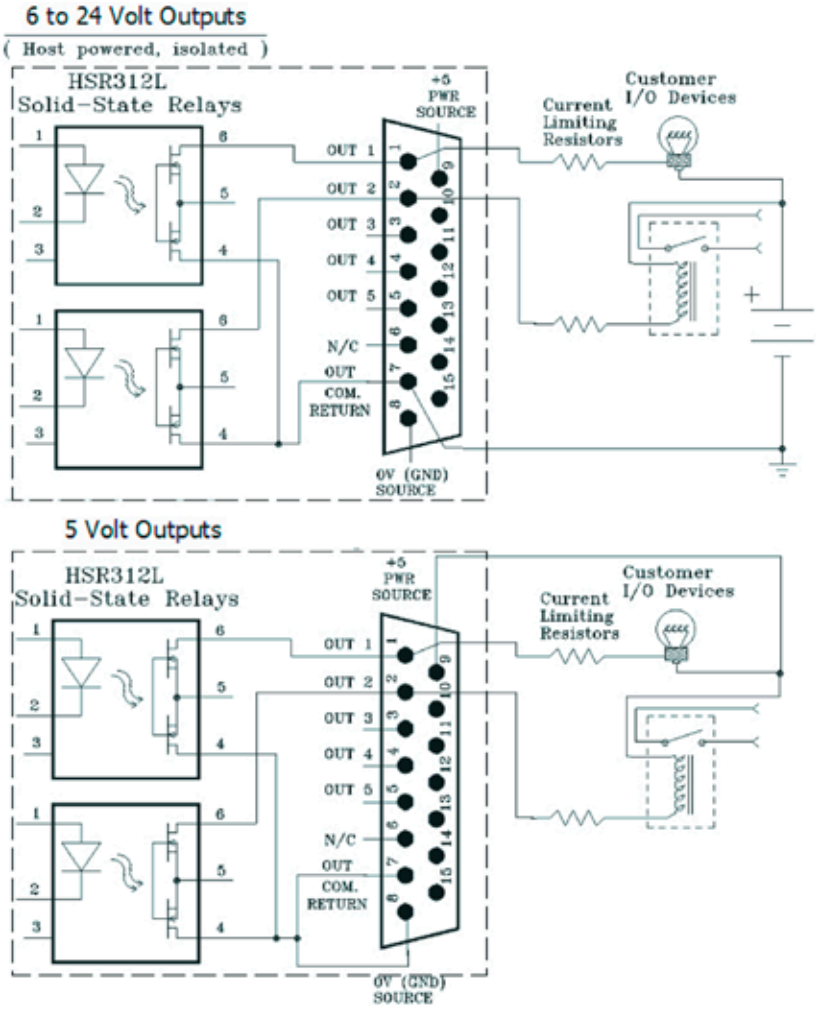

Figure 5-5: GPIO output connections

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An example of this sort of “virtual GPIO” operation is triggering the TALK TO EXT command and EXT PREVIEW command of the CR Monitor logic.

What's Next

When you’re ready, join us in Chapter 6 for a comprehensive “under the hood” discussion of Advanced Controls.

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Chapter Six:

Advanced Controls

Many of the RAQ/DESQ features can be customized by software settings.. And owners like you have given us great ideas for new operational capabilities, some of which are included in our periodic software updates. With that in mind, we strive to keep our documentation as up-to-date as possible.

If you have questions that are not covered here, we invite you to contact our 24/7 Support crew:

- by email at support@AxiaAudio.com
- by phone at +1 216-241-7225.

QOR Configuration Screens

The QOR Control Center

Figure 6-1 shows the screen that greets you when you log into your QOR from your Web browser. The main menu runs down the left side and gives access to options and settings. In the main window you can see at a glance what version of QOR software is loaded, system information, CPU statistics, and more. For diagnostic purposes, this information screen is openly accessible, but clicking on any menu heading will prompt you for a password. Here you'll find options related to the QOR.

The Status Screen

The Status screen is your home page. It displays basic system status as well as information pertaining to the active software load. A sample of this screen is shown in figure 6-1. Additional information displayed may include:

- QOR software version info including the current active Version and Base
- System Information including:
  - » Version of Linux kernel
  - » Uptime of the QOR expressed in days, hours and minutes
  - » CPU utilization
  - » Network Information
  - » Debug information
- File System Information - provides information on memory and solid state disk utilization for the operating system. This information may be requested by Axia tech support.

Figure 6-1: Status Screen

The Setup Menu

We touched briefly on the IP features of the Setup screen in Chapters 1 and 2. Now let's look at the rest of the tools on this page shown in Figure 6-2.

- **Network Configuration** contains the fields for the QOR IP Address and other network functions.
  - » **Hostname** is the unique name you give the console to identify it in the Web interface. You might want to name it after the studio it's in.
  - » **IP Address:** This is the network address of your QOR. We suggest that you have a plan to ensure that all of your Livewire devices are assigned unique, IP addresses.

Shortcut Key: You can also set the IP address of your QOR by pressing and holding the **Meter** key on the Console. Use the Preview knob to navigate and follow the prompts to give your QOR a new IP address.

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» **Netmask:** Enter your network's submask here. If you are not sure about this - consult your network administrator. In most cases a Netmask of 255.255.255.0 is suitable.

» **Gateway:** If you have a Core switch or a network gateway to allow access from outside your facility, enter that address here. A gateway is required for advanced IP address configurations and for connection to an external NTP server.

Note: A reboot is required when any changes are made to the network parameters on the QOR Setup Menu.

- **Web Access Password:** By default, the user name is set to "user" and the password is blank. If you want to add a password, type it in both boxes and click **Change.** Note that passwords will not display here once changed, so be sure to make a record of all password changes.

- **Software Update:** This is where you upload new QOR operating software.

» **Software Versions** shows you the software packages currently stored on your QOR flash memory card. The blue radio button is displayed next to the active software image.

» **Change Active Bank:** When you want to change the active software package, click on the radio button next to the image you wish to activate, and click this button. A reboot is necessary to load the new software choice.

» **Upload Image:** From time to time, Axia makes new software packages available for download from AxiaAudio.com/downloads/. Use the **Browse** and **Upload Image** buttons to install new software, as described in the Technical Bulletin that accompanies each software release. Note that uploading a new image will always over-write the inactive bank.

» **Reboot** shuts down QOR and restarts it. A reboot is required after changing active software or after changing any settings in your Network Configuration.

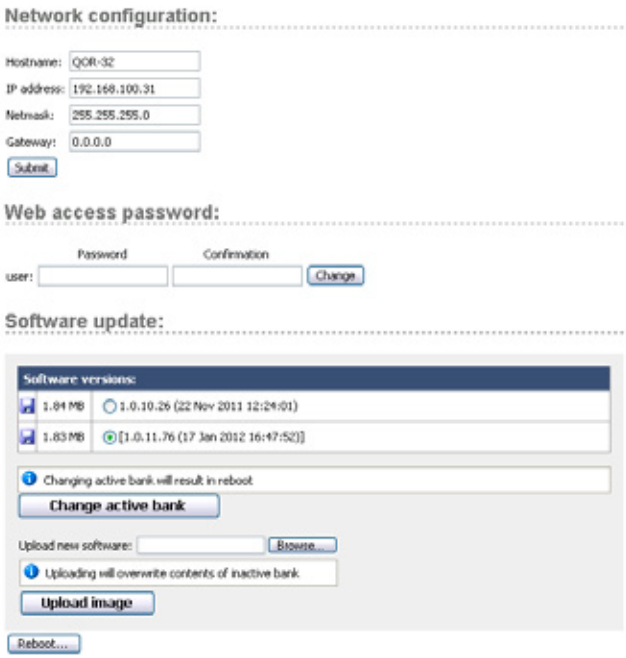

Figure 6-2: Setup Screen

Save your work! We recommend backing up your Configuration files whenever a major change is made, or is about to be made, to your QOR. Whether you are re-configuring Show or Source profiles *en masse* or about to perform a software update, it's always a good idea to have a copy of your important data.

The Customize Menu

The **Customize** page contains Clock settings and Backup/Restore functions. Future enhancements may include additional features in this area.

- **Clock Options (DESQ)**

» **Clock Format:** This is where you define whether you will view your time in 12 hour or 24 hour format. DESQ surfaces can use either the internal clock or an external time server for timekeeping. The next group of settings will set up NTP (Network Time Protocol) time sync.

» **Time Zone Offset:** Specify your local GMT offset in hours and minutes. For example, if you live in the Eastern Tome zone in the USA, your GMT offset will be -5 hours, 0 minutes. If you

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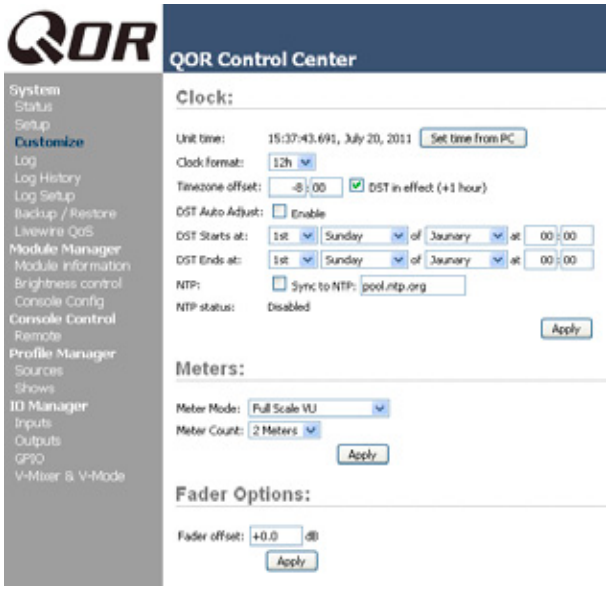

Figure 6-3: Customize Screen

live in Riga, Latvia, your offset will be +2 hours.

» **DST in effect (+1 hour):** In those area that implement Daylight Savings Time, this check box is used to tell your system to add one hour to the GMT offset.

» **NTP:** The check box should be checked if your DESQ's NTP clock sync function is enabled. To disable NTP service, simply un-check this box. The other box here is used to enter the IP address of your external NTP server. This server may be a PC on your local network or it may be the IP address of a public NTP server in the Internet. Note that you must specify an IP address – a URL will not work.

If you wish to connect to a public or external NTP server, be sure to specify a valid Gateway in your IP configuration.

- **Configuration:** This is an extremely important area of your QOR configuration since this is where you will backup all of the hard work you have done.

» **Backup Settings:** All QOR settings can be saved in a single operation and backed up to a location on your local drive. When you select the **Backup** option, you will see the familiar location navigator that prompts you for the folder in which you wish to store your backup file. The backup file will be named according to the device name, IP address and date/time the backup was performed. This naming conventions allows you to store multiple backups from multiple devices in the same location. An example of a backup file name might be **QOR-192.168.0.200-2012-03-25_17-13.xml.**

» **Restore Settings:** To restore a previous QOR backup, use the browse button to locate the backup and then select **Restore.**

Log, Log History and Log Setup Menus

QOR keeps a detailed log of user actions and other system events. Choosing the **Log** menu item lets you examine the last 100 logged activities; choosing the **Log History** menu item allows you to view an entire day's log at one time and delete old log files if you choose. The oldest log files are deleted automatically as storage space dictates.

The **Log Setup** menu item allows you to specify an external Syslog server and to configure the debug level. This menu also allows you to specify from eight different severity level filters. The filter choices (in order of decreasing severity) are:

- Emergency: system us unusable
- Alert: action must be taken immediately
- Critical: critical condition
- Error: error conditions
- Warning: warning conditions
- Notice: normal but significant condition
- Informational: informational messages
- Debug: debug level messages

Use this section as directed to do so by Tech Support.

The Module Manager

The **Module Manager** heading displays information about the control surfaces connected to your QOR. Some of these fields are for diagnostics; below is a list of those you might find useful:

» **Address:** displays the number Axia has assigned to each connected unit.

» **Type:** gives you the working name of the module.

» **State:** tells you whether or not the module is working, i.e., communicating with the CPU.

» **Ping**: Indicated ping response in ms.

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» **Messages, Idle Time, Uptime:** All indicate diagnostic information that is related to the CAN-Bus communications. Tech support may request this information for troubleshooting purposes.

» **Hardware Revision:** displays the hardware version of the module.

» **Firmware Version:** displays the firmware version that's loaded on the module.

» **Upload Firmware Group:** From time to time, new module firmware may become available from Axia. You may install new firmware by choosing Browse and then Upload.

NOTE: Updating a module takes it offline during the update process. While audio playing through the module's faders will continue uninterrupted, keep in mind that while updating (usually about 5-10 seconds) you will not be able to adjust gain or turn faders on or off on the module being updated.

Brightness Control Menu

This menu offers several options for setting the control surfaces to your studio's ambient lighting. All values are expressed in percent. The default setting will be suitable for most studio environments, however you may make adjustments as needed.

GPIO Configuration Menu

This menu is where you configure the assignments for the opto-isolated GPIO connections found on the rear panel of the QOR. For a thorough discussion of this screen and how to configure GPIO, please refer to **Chapter 5: Configuring GPIO**.

Remote

The remote function available through the web interface gives you many of the same controls that are on the surface:

- You have the option to load a Show profile by selecting the show in the dropdown selector, and then pressing the **Load** button.
- Each fader channel is shown with an option to change the source, change the ON state, assignments to the mixes, and Preview state.

In order to change a state, you must make the selection to the channel and press the **Apply** button for that row. This is control of a single channel at a time. Below the Fader Channels section are the controls for the monitors, where the source and volumes for a monitor can be adjusted.

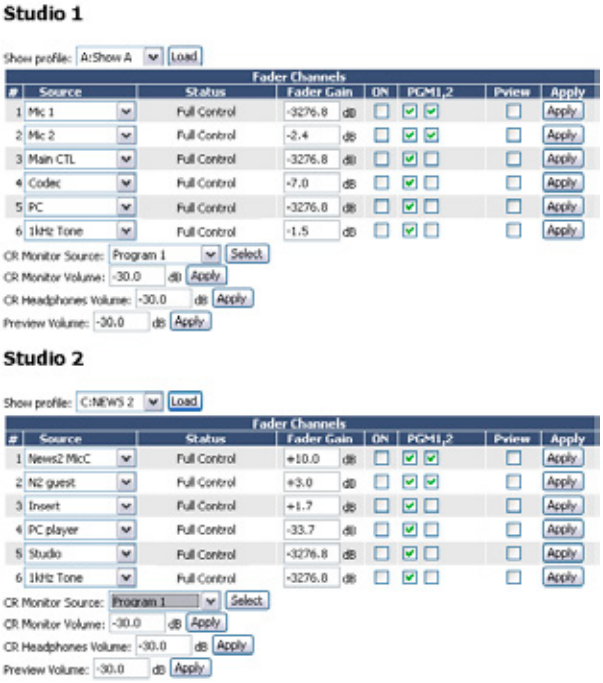
Studio 1
Show profile: A:Show A Load
Fader Channels
Source Status Fader Gain ON PGM1,2 Pview Apply
1 Mic 1 Full Control -3276.8 dB Apply
2 Mic 2 Full Control -2.4 dB Apply
3 Main CTL Full Control -3276.8 dB Apply
4 Codec Full Control -7.0 dB Apply
5 PC Full Control -3276.8 dB Apply
6 1kHz Tone Full Control -1.5 dB Apply
CR Monitor Source: Program 1 Select
CR Monitor Volume: -30.0 dB Apply
CR Headphones Volume: -30.0 dB Apply
Preview Volume: -30.0 dB Apply
Studio 2
Show profile: C:NEWS 2 Load
Fader Channels
Source Status Fader Gain ON PGM1,2 Pview Apply
1 News2 MicC Full Control +10.0 dB Apply
2 N2 guest Full Control +3.0 dB Apply
3 Insert Full Control +1.7 dB Apply
4 PC player Full Control -33.7 dB Apply
5 Studio Full Control -3276.8 dB Apply
6 1kHz Tone Full Control -3276.8 dB Apply
CR Monitor Source: Program 1 Select
CR Monitor Volume: -30.0 dB Apply
CR Headphones Volume: -30.0 dB Apply
Preview Volume: -30.0 dB Apply

Figure 6-5: Remote Screen

Profile Manager Menu

These menus allow you to construct and administer Show and Source Profiles specific to the console. Refer to **Chapter 2: Inputs and Outputs** and **Chapter 4: Show Profiles** for details on Source and Show profiles.

IO Manager Menu

These menus allow you to administer your QOR's audio Inputs and Outputs. Refer to **Chapter 2: Inputs and Outputs** for complete details on configuration of these controls.

Ethernet Switch settings (Preconfigured)

QOR contains an integrated Ethernet switch. This switch manages the multicast functions of the console and enables it to be connected to other devices via your managed Livewire LAN.

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NOTE: The SFP (small form-factor pluggable) slot is intended for utilization of fiber connections. In parallel are copper 1 Gbps ports. These ports are used for connections to other QORs or to a network switch. The remainder of ports are 100 Mbps ports for your Livewire enabled devices. Four of the ports also include PoE (Power over Ethernet) which can be used to power devices that utilize this technology.

What's Next

RAQ and DESQ are designed to be the perfect standalone IP consoles. But what if you want to use your RAQ or DESQ as part of a larger Livewire studio network? No problem! Read on as we configure networking options.

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Mimicking nature,

streams combine to form anew

many become one.

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Chapter Seven:

Networking with QOR

Axia invented networked audio for broadcast. We call it Livewire, and QOR uses this networking ability in several different ways:

- A RAQ or DESQ surface can load and utilize sources from other studios connected to your Livewire network.
- You may deliver DSP outputs from your QOR to the Livewire network for use by others.
- QOR can also use GPIO logic that is available on your Livewire network.
- The Livewire network allows you to use our companion software package, PathfinderPC, for numerous advanced functions.
- Up to four QOR engines can be configured daisy-chain style, without the need for an external core Ethernet switch, to take advantage of network redundancy provided by implementation of the Spanning Tree Protocol (STP) standard.
- Manage control surfaces remotely using its web browser interface.
- Configuration backup and restore operations may be performed over the network as well.

For an in-depth discussion of Livewire, please review our publication "**Introduction to Livewire: IP-Audio System Design Reference and Primer,**" which provides an excellent discussion of IP-Audio and how standard Ethernet can be used to transport real-time broadcast audio in a studio environment. This is available at AxiaAudio.com/manuals/.

Inputs

When connected to a network of devices, the QOR has access to these other resources.

QOR has a configurable gateway of 8-in and 8-out (8x8) OR 12-in and 4-out (12x4) Livewire channels with a larger network. To understand this, it might help to envision this network connection as a high-speed freeway, with 12 lanes coming towards your studio and 4 lanes going out (or 8 and 8).

Selecting the Source Input

In **Chapter 2: Inputs and Outputs**, we discussed the QOR's local inputs - those associated with the XLR and RJ-45 connectors on the rear panel. We saw how we could associate each of these physical inputs with a Source Profile. The type of source (CR mic, Guest mic, codec, phone, etc) determined parameters such as monitor muting and backfeeds.

When each Source Profile is configured, you have a choice for the Source Input. If you select one of the rear panel connectors, the console source is associated with that input. If you select **Livewire**, you are telling

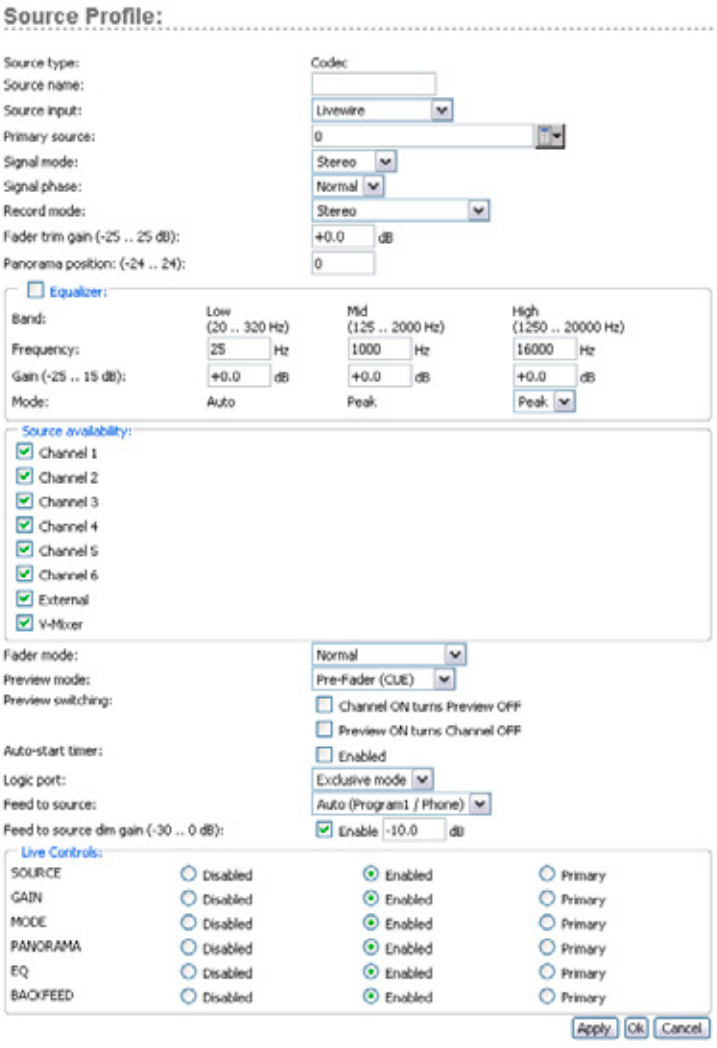
Source Profile:
Source type: Codec
Source name:
Source input: Livewire
Primary source: 0
Signal mode: Stereo
Signal phase: Normal
Record mode: Stereo
Fader trim gain (-25 .. 25 dB): +0.0 dB
Panorama position: (-24 .. 24): 0
Equalizer:
Band: Low (20 .. 320 Hz) Mid (125 .. 2000 Hz) High (1250 .. 20000 Hz)
Frequency: 25 Hz 1000 Hz 16000 Hz
Gain (-25 .. 15 dB): +0.0 dB +0.0 dB +0.0 dB
Mode: Auto Peak Peak
Source availability:
Channel 1
Channel 2
Channel 3
Channel 4
Channel 5
Channel 6
External
V-Mixer
Fader mode: Normal
Preview mode: Pre-Fader (CUE)
Preview switching:
Channel ON turns Preview OFF
Preview ON turns Channel OFF
Auto-start timer: Enabled
Logic port: Exclusive mode
Feed to source: Auto (Program1 / Phone)
Feed to source dim gain (-30 .. 0 dB): Enable -10.0 dB
Live Controls:
SOURCE Disabled Enabled Primary
GAIN Disabled Enabled Primary
MODE Disabled Enabled Primary
PANORAMA Disabled Enabled Primary
EQ Disabled Enabled Primary
BACKFEED Disabled Enabled Primary
Apply Ok Cancel

Figure 7-1: Codec Source

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the QOR that this source is not associated with a local input but is, instead, a source from elsewhere on your Livewire network. You may then assign that **Primary Source** by using the Browse button to choose from a list of Livewire sources. That's all there is to it!

Figure 7-1 shows an example of a codec source that's been configured as a Livewire Source Input with a network Primary Source. In this example, the Livewire **Channel Number** of that source is 1037 and it is coming from an Axia node named AES-103. The source has a designation of CODEC_1 on that node. Everything else in the configuration of the Source Profile is exactly the same as if that codec was connected directly to the QOR.

LiveWire Outputs:

#	Output	Name Override	Channel	Mode
1	Program 1		3301	Live Stereo
2	Program 2		3302	Live Stereo
3	Auto Backfeed		0	Disabled
4	Auto Backfeed		0	Disabled
5	S2 Program 1		3303	Live Stereo
6	S2 Program 2		3304	Live Stereo
7	Auto Backfeed		0	Disabled
8	V-Mix		3305	Standard Stereo

Apply

Figure 7-2: Livewire Outputs

Outputs

The Output configuration of the QOR has two sections: one for **Local Outputs** (rear panel connectors) and one for **Livewire Outputs**. As you might expect, the Local Outputs are usually configured for feeds to in-studio devices like CR Monitors, headphone amplifiers, etc.

The **Livewire Outputs** consist of four streams (12x4) or eight streams (8x8) from the QOR to your Livewire network. These streams will be available to other devices and users on your network.

The following parameters are configured for each of the Livewire Outputs:

- **Output**: Specifies the audio feed to be delivered to the network on each of the Livewire channels. Selections include:
  - » Any of the local inputs: microphones, stereo line or digital AES inputs.
  - » Any internal generated QOR sources including PGM-1, 2, CR Monitor, CR Headphones, Preview, Talk to CR, Talk to External, and Auto Backfeed.
  - » VMix or VMode outputs.
- **Name Override**: Allows you to specify a name (16 characters maximum) that will describe this QOR source to network users. This field will override the source name specified in the local Source Profile.
- **Channel**: The Livewire channel designation. Specify a unique channel number between 1 and 32,767 that will be used by the Livewire network to identify your QOR's network audio.
- **Mode**: Enables and chooses the stream priority for this channel. Options are:
  - » **Disabled** - the channel is off.
  - » **Live Stereo -** Choose this when the audio output contains live voices or other high-priority audio.
  - » **Standard Stereo** - Choose when the audio output consists of pre-recorded music or programming.

Networking

To deploy QOR in a network setting, you will interconnect the Ethernet switch built into your QORwith other QORs, or to external Ethernet switches. The custom Ethernet switch integrated into the QOR differs from an off-the-shelf network "core" switch in the following ways:

- The Ethernet switch in an QOR is always at the "edge" of a large Livewire network. In IT parlance, this type of switch is actually referred to as an "edge" switch.
- If you have a large Livewire LAN, you will usually have a central, high capacity, managed switch that handles all of the connections from your "edge" devices, including QOR switches. This central switch is referred to as your "core" switch. Common core switches include the Cisco 3750, 4948 and some of the 6400 series switches. The core switch is often completely populated with 1000BT ports.

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IT Note: If your system employs an Ethernet core switch, the Ethernet core switch must have an IP address numerically lower than any of your QOR units or Ethernet edge switches. This function of the IGMP standard ensures that the multicast querier is handled by the core switch if one exists. The querier function will be passed off transparently to another switch should the core switch fail or be disconnected.

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Appendix A:

Specifications

Microphone Preamplifiers:

Source Impedance: 150 ohms
Input Impedance: 4 k ohms minimum, balanced
Nominal Level Range: Adjustable, -75 dBu to -20 dBu
Input Headroom: >20 dB above nominal input
Output Level: +4 dBu, nominal

Analog Line Inputs:

Input Impedance: 20 k Ohms
Nominal Level Range: Selectable, +4 dBu or -10dBv
Input Headroom: 20 dB above nominal input

Analog Line Outputs:

Output Source Impedance: <50 ohms balanced
Output Load Impedance: 600 ohms, minimum
Nominal Output Level: +4 dBu
Maximum Output Level: +24 dBu

Digital Audio Inputs and Outputs:

Reference Level: +4 dBu (-20 dB FSD)
Impedance: 110 Ohm, balanced (XLR)
Signal Format: AES-3 (AES/EBU)
AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 20 kHz to 216kHz input sample rate capable.
AES-3 Output Compliance: 24-bit
Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
Internal Sampling Rate: 48 kHz
Output Sample Rate: 48 kHz
A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
Latency <3 ms, mic in to monitor out, including network and processor loop

Frequency Response:

Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

Dynamic Range

Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dBFS
Analog Input to Digital Output: 105 dB referenced to 0 dBFS
Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
Digital Input to Digital Output: 125 dB

Equivalent Input Noise

Microphone Preamp: -128 dBu, 150 ohm source, reference -50 dBu input level

Total Harmonic Distortion + Noise

Mic Pre Input to Analog Line Output: <0.005%, 1 kHz, -38 dBu input, +18 dBu output
Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

Crosstalk Isolation, Stereo Separation and CMRR

Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kH
Microphone channel to channel isolation: 80 dB isolation minimum, 20 Hz to 20 kHz
Analog Line Stereo separation: 85 dB isolation minimum, 20Hz to 20 kHz
Analog Line Input CMRR: >60 dB, 20 Hz to 20 kHz
Microphone Input CMRR: >55 dB, 20 Hz to 20 kHz

Power Supply AC Input, iQ Core with iQ Console

Auto-ranging supply, 90VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
Power consumption: 100 Watts

Operating Temperatures

-10 degrees C to +40 degrees C, <90% humidity, no condensation

Dimensions

DESQ
W 15.31in (388.85 cm), H 15.30 in (388.72 cm), D 2.79 in (57.15 cm)

RAQ
W 19.0 in (48 cm), H 3RU, 6.97 in (177.0 cm), D 2.54 in (64.50 cm)

QOR.16
W 19 in (48 cm), H 2 RU, 3.47 in (8.80 cm), D 8.45 in (21.46 cm)

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Table of Inputs and Outputs

Main Outputs	Type	Comments
Program 1	Stereo	Main stereo bus (Usually referred to as Program)
Program 2	Stereo	Second stereo bus (Sometimes referred to as Audition)
V-Mixer	Stereo	Stereo Submix - sum of one stereo source
V-Mode	Stereo	Used for processing MONO sources and creation of MONO streams

Monitor-related Outputs	Type	Comments
CR Monitor	Stereo	Control room monitor speakers, source and level controlled by Monitor 1 control
CR Headphone	Stereo	Control room (board op) headphone, source and level controlled by headphone
Preview	Stereo	Allows the connection and level control of external powered speakers.
Talk to External	Mono	Allows board operator mic to talk to other devices, a logic command is associated
Talk to CR Audio	Mono	Allows the Talk to CR audio mix to drive an external destination

Monitor-related Inputs	Type	Comments
External Preview Input	Stereo	Allows an external path into the preview speakers, a logic command is associated
External Monitor Input 1	Stereo	Allows an external source to be monitored by CR or studio selectors
External Monitor Input 2	Stereo	Allows an external source to be monitored by CR or studio selectors

Source Inputs	Type	Comments
Microphone Input *n*	Mono	Typical installations have 2 microphone sources per studio

Source-related Outputs	Type	Comments
Feed-to-Source A *n*	Mono	Mono mix-minus output feeds the left side of a stereo connection. “Talk to...” function enabled.
Feed-to-Source B *n*	Mono	Mono mix-minus output feeds the right side of a stereo connection. “Talk to...” function disabled.

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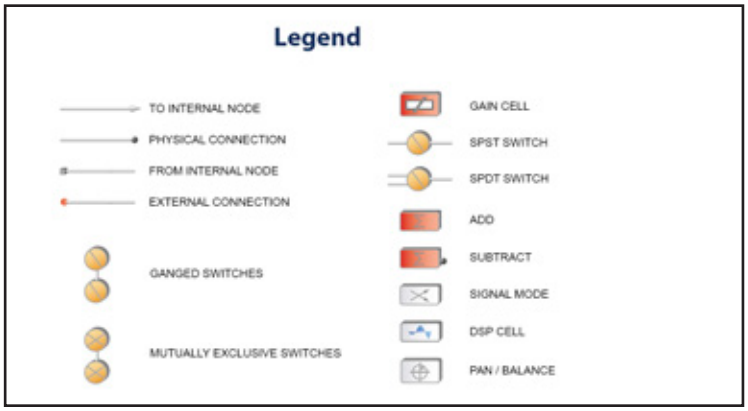
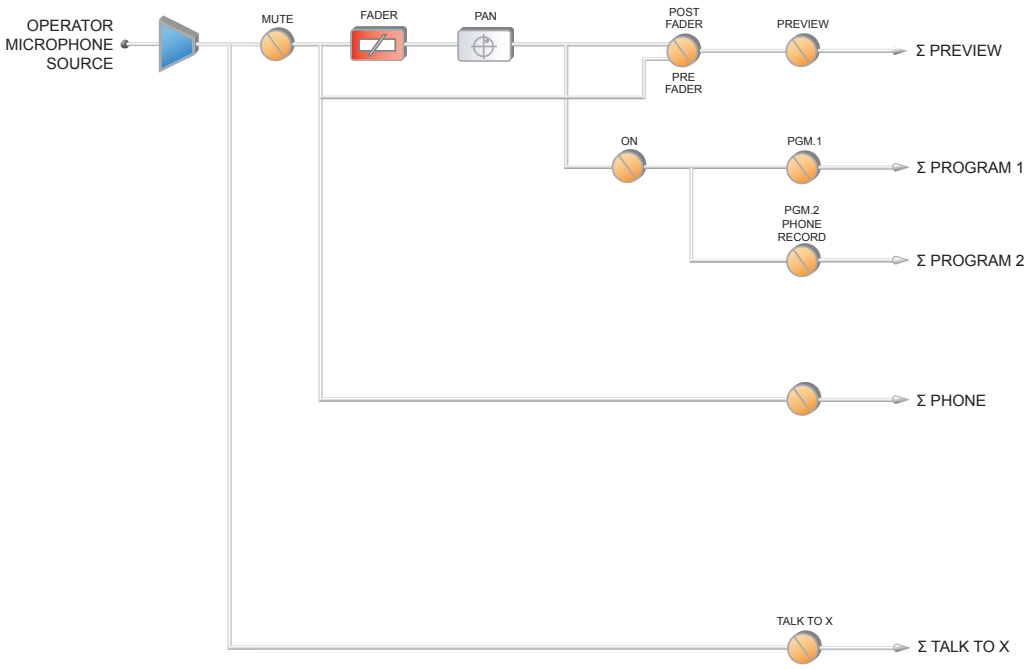
Appendix B: Block Diagrams





Revised: March 2012

Figure B-1 Block Diagram - Operator Microphone

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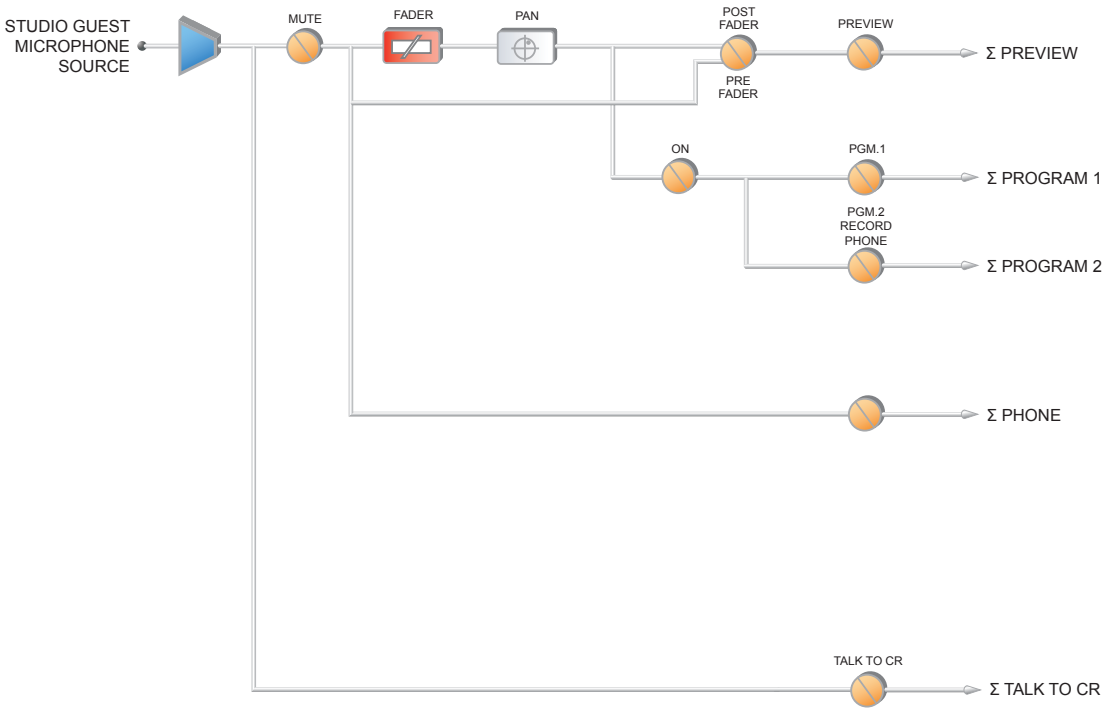
Block Diagrams



Revised: March 2012

Figure B-2 Block Diagram - Guest Microphone

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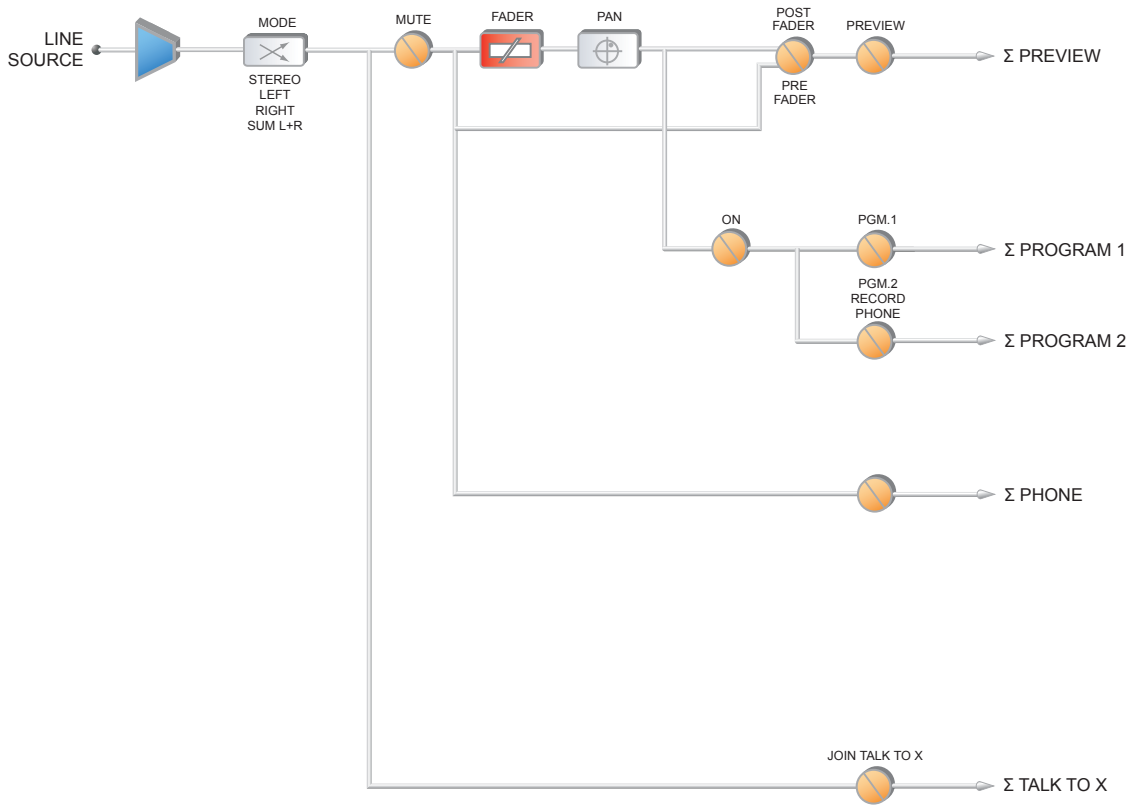
Block Diagrams



Revised: March 2012

Figure B-3 Block Diagram - Line Source

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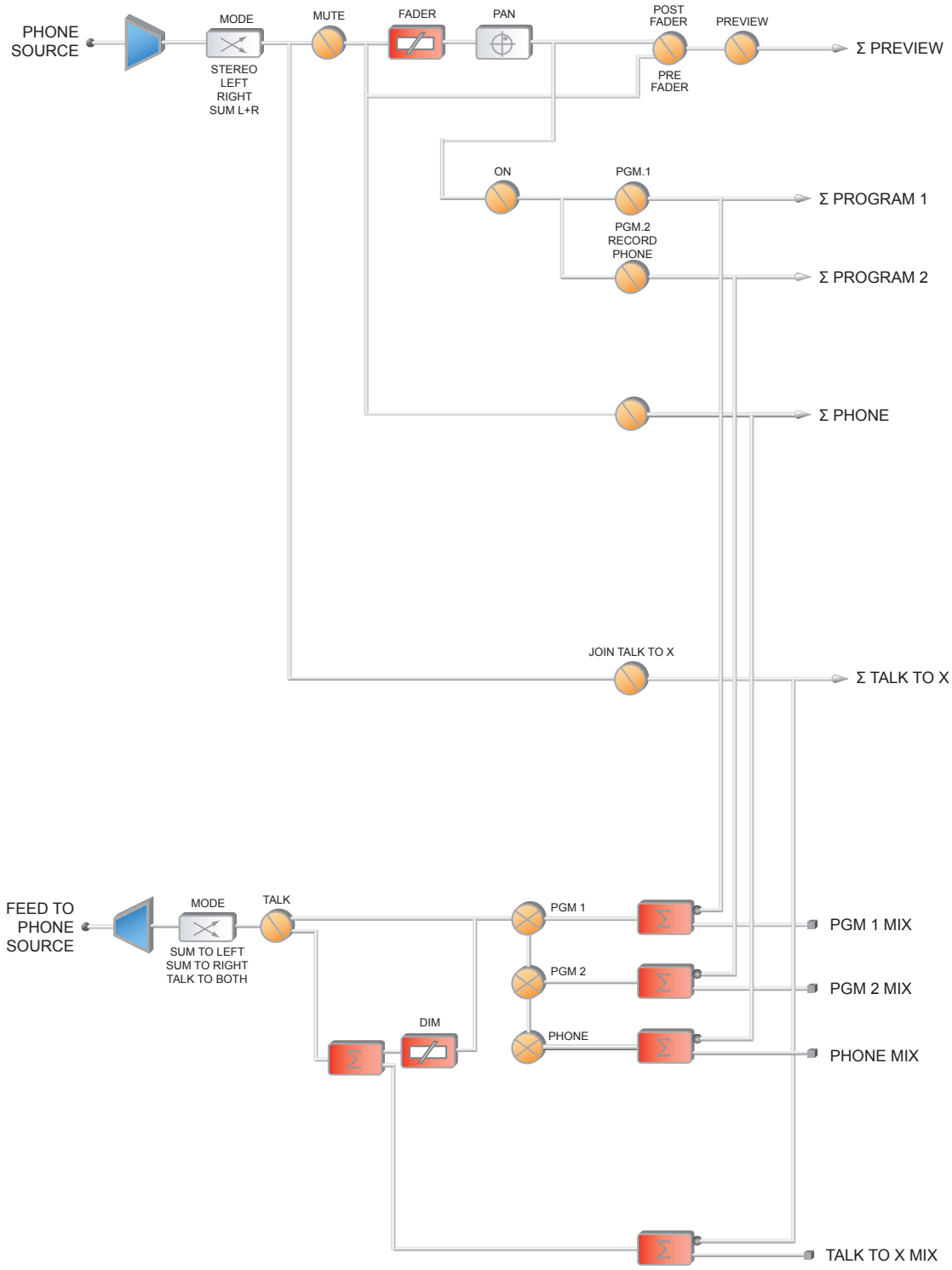
Block Diagrams



Revised: March 2012

Figure B-4 Block Diagram - Phone Source

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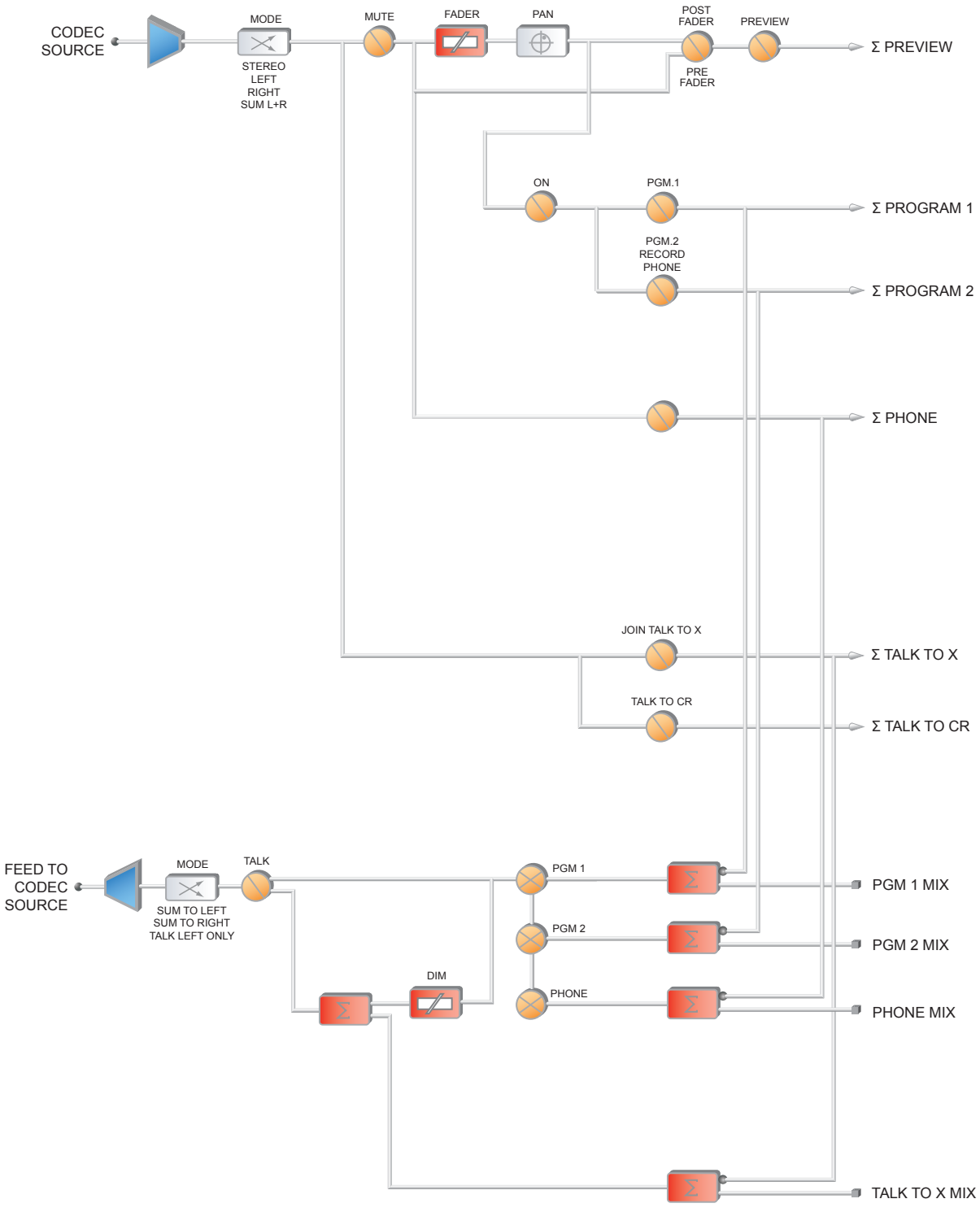
Block Diagrams



Revised: March 2012

Figure B-5 Block Diagram - Codec Source

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Block Diagrams

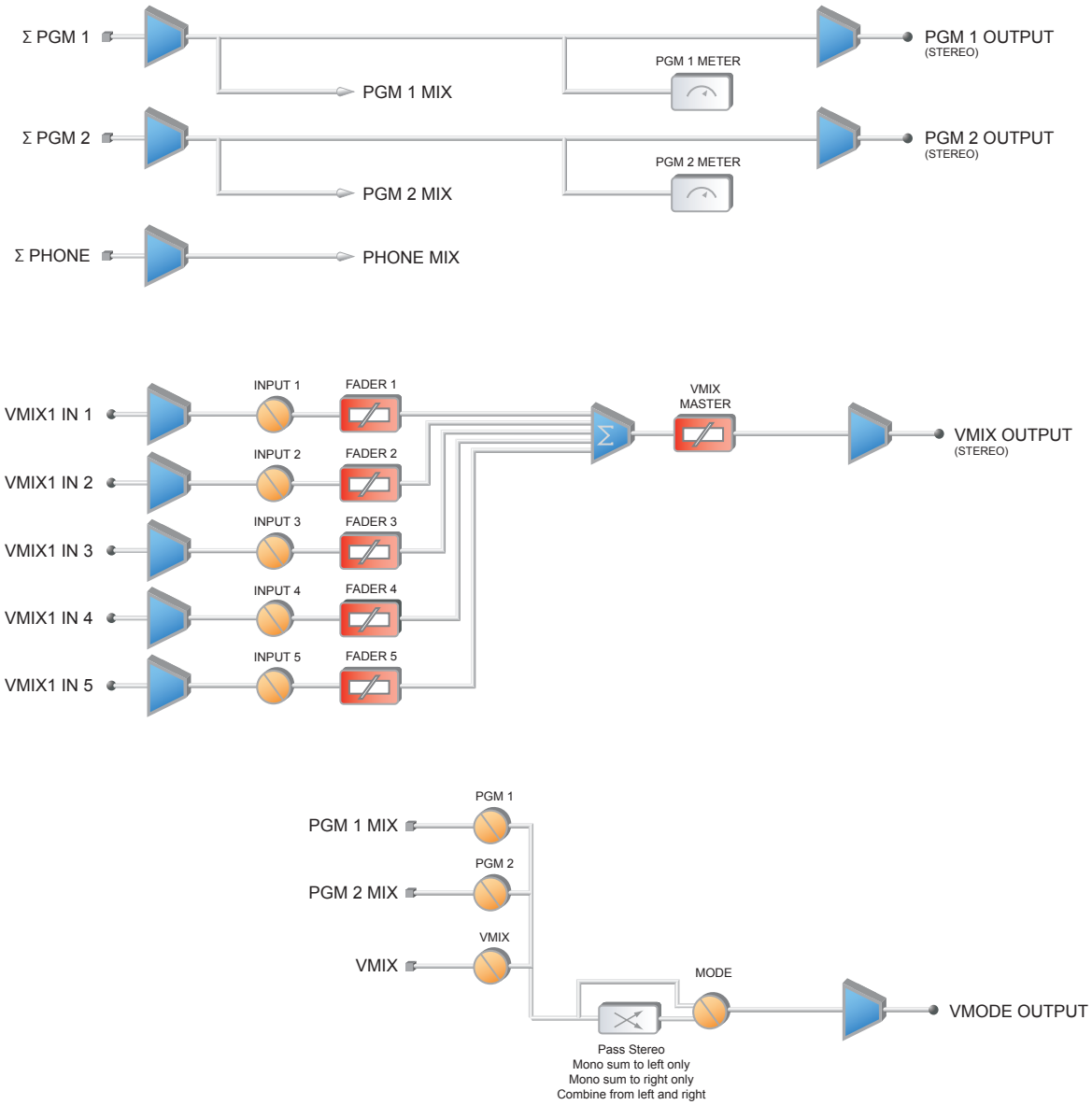

Figure B-6 Block Diagram - Master Output

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Block Diagrams

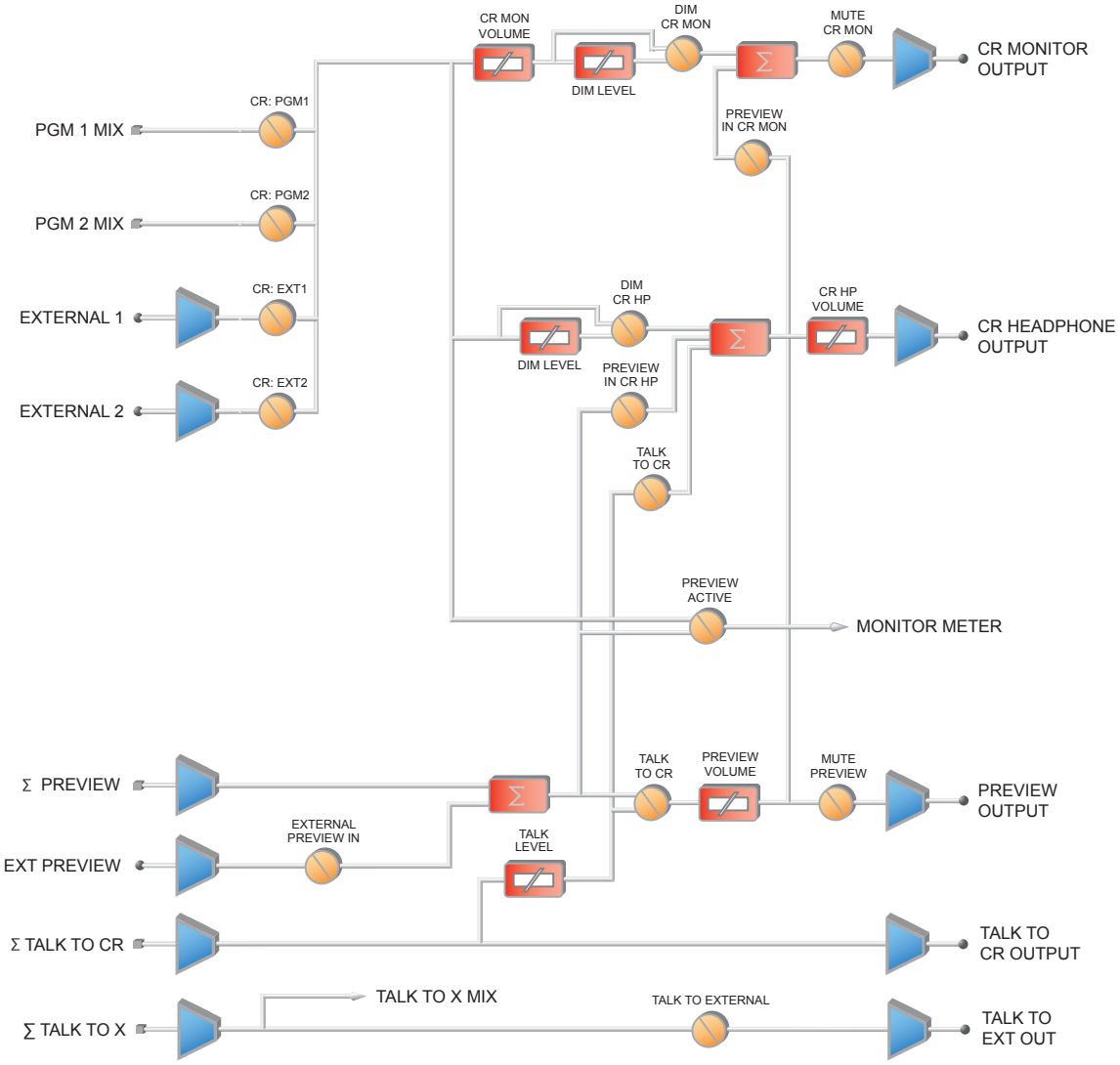

Figure B-7 Block Diagram - Monitor Output

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The cup steams, sweet scent

wafting lightly in the air.

Mmmmm... it is Earl Grey.

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Appendix C: Channel / IP Worksheets

The scalable nature of Axia Livewire audio networks makes it possible to construct systems of any size - from a single room to an entire multi-studio facility.

Since Livewire components – Audio Nodes, Elements, StudioEngines, PowerStation, etc. – are connected with Ethernet, each one requires a unique IP (Internet Protocol) address. IP addresses are four bytes long and are written in "dotted decimal" form, with each byte represented decimally and separated by a period. For example, in the IP address 193.32.216.9, the 193 is the value for the first byte, 32 for the second, etc. Since a byte can hold values from 0 to 255, this is the range for each decimal value. If you run a public network, Host IP addresses are assigned to your organization by your internet service provider and parceled out to individual host computers by your network administrator. He may give you this number to be entered manually, or could opt for DHCP (Dynamic Host Configuration Protocol) to let your computer get the address automatically from a pool. Because Livewire devices are permanently attached and because it is more desirable to know the IP address attached to a particular node (and perhaps assign them in some kind of logical pattern), we do not support DHCP for our hardware nodes. Therefore, you will need to enter an IP address into each node.

Livewire systems can support over 10,000 channels of audio; this necessitates giving each audio source or destination its own unique identifier, called *Channel ID numbers*.

As you can imagine, keeping track of so many unique IP addresses and Channel ID numbers is a big job. Therefore, on the next few pages, we've provided you with worksheets that you can use to keep track of the numbers you've assigned.

A logical convention that is often followed will link the Livewire channel number to the last octet of the device IP address. For example, if a node has an IP address of 192.168.1.12, the channel numbers assigned to the 8 sources of that node might be 1201 through 1208.

For a more detailed explanation of IP addresses, subnet masks and related issues, we highly suggest that you refer to "Network Engineering For Audio Engineers", Chapter 8 of our *Introduction to Livewire: IP Audio System Design Reference and Primer.*

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Axia IP Address Assignment Worksheet

IP Address	*Device Name*	*Location*	*Notes*
. . .			
. . .			
. . .			
. . .			
. . .			
. . .			
. . .			
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Axia Audio Channel Assignment Worksheet - SOURCES

Channel ID Number	*Device Name*	*Device Location*	*Notes*

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Axia Audio Channel Assignment Worksheet - DESTINATIONS

Channel ID Number	*Device Name*	*Device Location*	*Notes*

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Warranty

Axia Audio Limited Warranty

This Warranty covers “the Products,” which are defined as the various audio equipment, parts, software and accessories manufactured, sold and/or distributed by TLS Corp., d/b/a Axia Audio (hereinafter “Axia Audio”).

With the exception of software-only items, the Products are warranted to be free from defects in material and workmanship for a period of five (5) years from the date of receipt by the end-user. Software-only items are warranted to be free from defects in material and workmanship for a period of 90 days from the date of receipt by the end-user.

This warranty is void if the Product is subject to Acts of God, including (without limitation) lightning; improper installation or misuse, including (without limitation) the failure to use telephone and power line surge protection devices; accident; neglect or damage.

EXCEPT FOR THE ABOVE-STATED WARRANTY, AXIA AUDIO MAKES NO WARRANTIES, EXPRESS OR IMPLIED (INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE).

In no event will Axia Audio, its employees, agents or authorized dealers be liable for incidental or consequential damages, or for loss, damage, or expense directly or indirectly arising from the use of any Product or the inability to use any Product either separately or in combination with other equipment or materials, or from any other cause.

In order to invoke this Warranty, notice of a warranty claim must be received by Axia Audio within the above-stated warranty period and warranty coverage must be authorized by Axia Audio. If Axia Audio authorizes the performance of warranty service, the defective Product must be delivered, shipping prepaid, to: Axia Audio, 1241 Superior Avenue, Cleveland, Ohio 44114.

Axia Audio at its option will either repair or replace the Product and such action shall be the full extent of Axia Audio’s obligation under this Warranty. After the Product is repaired or replaced, Axia Audio will return it to the party that sent the Product and Axia Audio will pay for the cost of shipping.

Axia Audio’s authorized dealers are not authorized to assume for Axia Audio any additional obligations or liabilities in connection with the dealers’ sale of the Products.

Axia Audio’s products are to be used with registered protective interface devices which satisfy regulatory requirements in their country of use.

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